



Promoting Agrifood Sector Transformation in Bangladesh

Policy and Investment Priorities

Mansur Ahmed, Jean Saint-Geours, and Ciliaka Gitau

INTERNATIONAL DEVELOPMENT IN FOCUS

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MANSUR AHMED, JEAN SAINT-GEOURS, AND CILIAKA GITAU

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Contents

Foreword vii

Acknowledgments ix

About the Authors xi

Executive Summary xiii

Abbreviations xvii

CHAPTER 1 Introduction 1

Context of the study	1
Transformation of the agrifood system: Where does Bangladesh stand?	6
Objectives of the report	9
Analytical approach and data	10
Structure of the report	11
Note	11
References	12

CHAPTER 2 Agrifood Sector Transformation in Bangladesh 13

Introduction	13
Agriculture and its past performance: Self-sufficiency in rice production	13
Agricultural diversification In Bangladesh: Past trends and patterns	18
Potential for and scope of agricultural diversification	28
Notes	38
References	39

CHAPTER 3 Agricultural Diversification and Modernization 41

Challenges and Opportunities

Introduction	41
Performance of the agrifood value chain	42
Performance and key challenges for support services	54
Performance and key challenges of the business climate	60
Summary of key cross-sectoral constraints	64
Notes	69
References	69

CHAPTER 4 Agricultural Diversification and Modernization 73*Lessons from Three Selected Products*

Introduction	73
Three products: Maize, Potatoes, and Mangoes	73
Livestock feed ingredients: Maize	75
Vegetables: Potatoes	79
Fruits: Mangoes	85
Notes	90
References	90

CHAPTER 5 Moving Forward 93*Priority Areas of Action*

Summary of the key challenges	93
Proposed areas of action	94

APPENDIX A 99**Boxes**

1.1	Implications of the COVID-19 pandemic for the agrifood sector	5
1.2	Sustainable farming approaches	5
3.1	Potato seed supply	50

Figures

1.1	GDP and employment shares by sectors	2
1.2	Annual trend growth rates	2
1.3	Share of employment and GDP in agriculture	7
1.4	Distribution and changes in agrifood sector jobs between 2005 and 2016	8
1.5	The agrifood sector ecosystem	11
2.1	Importing of cereals (five-year moving average)	14
2.2	Inputs, TFP, and output growth, 1981–2016	14
2.3	Agricultural TFP growth among Asian countries	15
2.4	Decomposition of annual income growth (4.2 Percent), 2000–14	15
2.5	Changes in shares of rural household incomes, 2000–2014	16
2.6	Changes in agricultural inputs use, 1981–2016	17
2.7	Crop and animal production in Bangladesh	19
2.8	Paddy area and output, FY2000/01–FY2017/18	20
2.9	Change in crop areas, 2008–18	21
2.10	Access to irrigation and crop diversification index, by farm size	21
2.11	Share of rural households engaged in livestock and poultry production (percent)	22
2.12	Fish and shrimp production, FY2006/07–FY2016/17	23
2.13	Simpson's Diversity Index by household data	26
2.14	Proportion of farm households growing only rice by farm size	26
2.15	Crop diversification and access to markets	27
2.16	Volatility of prices for selected commodities	27
2.17	Change in food intake, 2000–2016	29
2.18	Projected increase in total consumption, 2015–30	30
2.19	Average food consumption and production, 2014–17	30
2.20	Top 20 products representing 90 percent of agrifood imports, 2015–18	31
2.21	Percentage of import value by category	31
2.22	Trade balance of agricultural products, 1966–2017	32
2.23	Importation and exportation of agricultural goods, 2007–17	32
2.24	Share and value of exports, 2017–18	33
2.25	Percentage of export value by category of total average export value 2015–18	33

2.26	Top 20 products, representing 88 percent of agrifood exports, 2015–18	34
2.27	Export of shrimp and fish, FY1999/2000–FY2016/17	35
2.28	Yield evolution for selected products, in MT per hectare or kg per animal, 1998–2018	36
2.29	Potential value of exports	36
3.1	The agrifood value chain	42
3.2	Real wage index, base = 100, FY1969/70	46
3.3	Share of female agricultural workers	47
3.4	Farm mechanization rates in selected countries	47
3.5	Access to agricultural machinery and Simpson’s Diversity Index	49
3.6	Index of industrial production	52
3.7	Distribution of agrifood enterprises in 2013	53
3.8	Crop diversification and utilization of transport for carrying produce	57
3.9	Production and postharvest loss	59
3.10	Bangladesh: <i>Enabling the Business of Agriculture 2019</i> scores	61
3.11	Rejection rate for fresh fruit and vegetable trade to the EU (2014–16)	62
3.12	On-farm productivity constraints along the agrifood value chain	65
3.13	Off-Farm value addition and commercialization constraints along the agrifood value chain	66
4.1	Human protein consumption	76
4.2	Imports of livestock feed ingredients	76
4.3	Maize production in Bangladesh	77
4.4	Soybean production in Bangladesh	77
4.5	Buildup of costs along the maize marketing chain	78
4.6	Total vegetable production, 2008–17	80
4.7	Total potato production, 2009–17	80
4.8	Vegetable and potato exports, 2009–18	81
4.9	Fruit and vegetable trade, 2000–19	81
4.10	Destinations of vegetable and fruit exports, FY2017/18	81
4.11	Potato export destinations, FY2017/18	82
4.12	Sources of imported fruits and vegetables, FY2017/18	82
4.13	Vegetable production by type, 2008–17	83

Map

2.1	Simpson’s Diversity Index by districts	25
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Photos

4.1	A vegetable nursery in Rangpur	79
4.2	A mango garden in Rangpur District	86

Tables

2.1	Annual growth of GDP (period averages at constant prices) and sectoral share of GDP	17
2.2	Diversification and its sources, 2000–2016	20
2.3	Annual growth in fisheries area, output, and yield, FY2005/06 and FY2017/18	24
2.4	Comparison of national crop and livestock yields, annual average, 2014–18	35
2.5	Projected gross margins for rice and selected other crops in Bangladesh	37
3.1	Agricultural land by division and by utilization, FY2017/18	44
3.2	Irrigation coverage, FY2016/17	45
3.3	Status of farm mechanization	48
3.4	Agricultural lending, FY2016–FY18	55
3.5	Transport mode use for agricultural freight	58

3.6	Projected gross margins, assuming real cost of fertilizer in Bangladesh	64
4.1	Estimated size of different vegetable market segments	84
A.1	Pattern of crop diversification in Bangladesh and across divisions, 2014-18	99
A.2	Commodity balance, 2000-17	100
A.3	Regression results: Correlates for crop diversification in Bangladesh	101
A.4	Yield advantage and revealed comparative advantage of Bangladeshi agricultural commodities	102

Foreword

Bangladesh's agriculture sector has undergone a profound transformation and has achieved laudable success in attaining near self-sufficiency in rice production. The sector has been critically important in ensuring food security, including during the COVID-19 pandemic, and providing livelihoods for the majority of people in rural areas. With rapid urbanization and income growth, however, dietary patterns are changing in Bangladesh, bringing both challenges and huge opportunities for inclusive growth. The agricultural sector needs, more than ever, a balanced and forward-looking strategy for increased diversification toward high-value crops and more modernization along the agrifood value chain. This is critical if Bangladesh is to realize its strong potential for a transformation of the food system that is inclusive and resilient and contributes to healthier people, a healthier economy, and a healthier planet.

This report, *Promoting Agrifood Sector Transformation in Bangladesh: Policy and Investment Priorities*, is the result of a partnership between the government of Bangladesh and the World Bank. It rigorously looks at the constraints and the opportunities for diversification and modernization of the agrifood sector. The findings are compelling. Bangladeshi farmers rely on paddy production, even though they experience very low profit margins from it. An important message of this study is that there are substantial domestic market opportunities for productive diversification and value addition for the agrifood sector in Bangladesh as dietary patterns are changing in the country with rapid urbanization and income growth. This study has identified critical constraints to realizing the enormous potential of the diversification and modernization of the agrifood sector—covering constraints that span the entire agrifood ecosystem as well as documenting various constraints specific to individual nodes of the value chain. The report finds that, as some constraints are related to support services and yet others stem from the country's business climate, the path to transformation is a combination of policy reform and investment.

In its policy reform leadership early in the past decade, Bangladesh served as a shining global example of policy reform-based growth. The reforms had a significant positive impact on agricultural productivity growth. I trust that this report will offer a guide to the formulation of the next wave of policies that can facilitate agriculture's transformation to a more diverse, commercialized, and

resilient food system, which is key to unleashing rural growth and supporting jobs in the rural areas. The findings will find broad appeal with development practitioners in the country and encourage them to work together with the government on the policy and investment priorities outlined in the report. It is to be hoped that publishing this report, a joint product with the government of Bangladesh, will inform policy, identify strategic directions, and adopt public investment priorities that can unleash resilient and inclusive growth in the agriculture sector for food system transformation that will improve the lives of rural people in Bangladesh.

Mercy Miyang Tembon
Country Director
Bangladesh and Bhutan
The World Bank

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About the Authors

Mansur Ahmed is an Economist in the Agriculture and Food Global Practice of the World Bank, where he works on analytical and operational tasks in the areas of agriculture and food security, rural nonfarm economy, and rural employment. His research interests include agriculture policies, farm productivity and efficiency analysis, rural incomes and poverty analysis, and rural transformation in the context of developing countries. Over the past years, he has worked substantially in the areas of agricultural productivity, rural jobs, and rural nonfarm economy in Afghanistan, Bangladesh, Bhutan, China, India, Mali, Myanmar, and Nepal. Prior to working in the World Bank, he worked at the Bangladesh Institute of Development Studies and at the South Asia Network on Economic Modeling in Bangladesh. He holds a bachelor's degree and a master's degree in economics from the University of Dhaka and a PhD in economics from the North Carolina State University.

Ciliaka Gitau is an Economist in the Finance, Competitiveness, and Innovation Global Practice of the World Bank, where she works on analytical and operational tasks in the areas of economic zone development, competitiveness, entrepreneurship support, and sustainable tourism development. Her research interests include small and medium enterprise development, regional trade and integration, and private sector development. Prior to working for the World Bank, she was a tutorial fellow at the University of Nairobi, School of Economics. She holds a master's degree and a PhD in economics from University of Nairobi.

Jean Saint-Geours is a Senior Economist in the Agriculture and Food Global Practice of the World Bank, which he joined in 2020 from the International Finance Corporation (IFC), where he had been working since 2012. In his previous role, he notably developed the Agribusiness Deep Dive methodology to scope and design agribusiness development projects. This methodology has informed the design of projects across the World Bank Group and contributed to IFC's Country Private Sector Diagnostics in countries in Latin America and the Caribbean, the Middle East and North Africa, South Asia, and Sub-Saharan Africa. Saint-Geours also coordinated the work on warehouse receipt financing

(WRF) reforms, through which he designed and implemented WRF reform projects across Sub-Saharan Africa and published the “Guide to Warehouse Receipt Financing Reform.” Prior to joining the Bank Group, he worked for an international retail firm and for a management consultancy. He holds a master’s degree in management from ESCP Europe and an MBA from Columbia Business School.

Executive Summary

AGRICULTURE'S A CENTRAL ROLE IN BANGLADESH'S ECONOMY, ESPECIALLY IN RURAL AREAS

The agriculture sector has been critically important in reducing poverty in Bangladesh, and further progress in agriculture will remain important as Bangladesh's economy continues to evolve. Since 2000, Bangladesh has recorded impressive economic growth and poverty reduction. Real gross domestic product per capita increased from US\$525 in 2000 to US\$1,203 in 2018, and rural areas registered significant poverty reduction: from 52.3 percent in 2000 to 26.7 percent in 2016. Between 2005 and 2010, the agriculture sector contributed 69 percent of total poverty reduction; from 2010 to 2016, the contribution was more modest (27 percent). Poverty, meanwhile, remains relatively skewed toward rural as compared to urban areas.

Declining growth in agricultural productivity poses a substantial risk to the development of the rural economy. The slowdown in agricultural growth since 2010 has been mainly driven by a slowdown in the growth of total factor productivity—from 2.4 percent from 2001 to 2010 to 1.0 percent from 2011 to 2016—along with a continuous decline in the growth of input use. Given the high level of labor intensity in agriculture, the slowdown in agricultural growth is one key reason for the declining role of agriculture in rural poverty reduction, and the slowdown in the growth of rural employment. The rural nonfarm economy also depends on the performance of agriculture; hence, the slowdown of the sector is posing serious challenges for overall rural economic development.

Bangladesh has made significant agricultural policy reforms since the 1980s that have largely contributed to achieving self-sufficiency in rice production. However, these policies are also contributing to a strong bias against more diversified production. The reforms were made in order to liberalize the agricultural input market in the 1980s, particularly in relation to fertilizing and irrigation; in the 1990s, these reforms were followed by reforms in the seed sector initiated through the National Seed Policy. This policy support focused significantly on rice production through input subsidies and public procurement of rice. Repurposing the country's agricultural support will be key to balancing the incentive structure across crops and promoting diversification within the sector.

There are substantial market opportunities for productive diversification and value addition for the agrifood sector in Bangladesh. With rapid urbanization and income growth, dietary patterns are changing in Bangladesh. The average amount of cereal intake is declining, and the demand for nutrient-dense foods is growing. A projection of increased demand for food commodities shows that, by 2030, total demand for eggs, fruits, meat, and fish will rise by more than 50 percent, as compared to consumption levels in 2016. However, domestic production is facing challenges in meeting the growing demand for higher-value commodities; from 2007 to 2017, Bangladesh's agricultural imports multiplied by a factor of three (to US\$10.7 billion). The private sector is gradually becoming more involved in making significant investments in processing and improved marketing to meet this growing demand. Still, additional productive diversification in agriculture and modernization along the agrifood value chain are needed to allow the sector to seize emerging domestic market opportunities.

The agrifood ecosystem analysis carried out for this study has identified critical constraints to the diversification and modernization of the agrifood sector. These constraints fall under three broad categories: (1) on-farm productivity constraints, (2) off-farm value addition and commercialization constraints, and (3) cross-sectoral enablers. Bangladesh is currently not competitive in terms of yields for many of its agricultural products when compared to its regional peers and world averages, with the notable exception of paddy rice. Bridging these productivity gaps will be essential to increase production and improve cost competitiveness. Major productivity constraints include land fragmentation and informality in the land rental markets; limited access to quality seeds for non-paddy crops; limited knowledge of and adoption of good agricultural practices (GAPs), reflected in unbalanced use and overuse of inputs; and limited use of farmer aggregation models, which constrains the delivery of extension services, access to financing, and linking with markets. Other key constraints are preventing off-farm value addition and commercialization in the sector. These constraints include the limited number of formal off-takers, inadequate and costly marketing infrastructure and logistic services, inadequate upholding of appropriate food safety practices and product quality standards, and a poorly designed export subsidy policy. These constraints are exacerbated by other cross-sectoral issues such as access to finance and the overall challenges of the country's investment climate and competitiveness enablers.

Evidence from the maize, potato, and mango subsectors illustrates both the untapped potential to better serve the domestic market and the need to address key constraints. Through an in-depth assessment of selected subsectors, this study confirms that several crops would offer Bangladeshi farmers an opportunity to diversify to higher-margin crops. For each of the analyzed subsectors, however, a specific subset of the key constraints identified are preventing actors along the value chain from increasing production and adding value—and from reaching higher-value markets.

The COVID-19 crisis has hit Bangladesh's economy and its agrifood sector hard, and lasting impacts can be expected. The International Monetary Fund has projected a reduction of economic growth in 2020 to 3.8 percent, against an earlier projection of 7 percent. A recent study shows that, beyond the 20.5 percent of the population that is officially recognized as poor, an additional 23 percent of Bangladeshis have fallen into poverty since the COVID-19 outbreak. The pandemic has impacted the agrifood sector through both supply chain disruptions and decreasing demand. With markets closed, trade

disrupted, and travel limited, many producers have nowhere to sell their produce and are losing their livelihoods. Both during and in the direct aftermath of the crisis, relief measures will be needed to ensure that the population can afford and access nutritious food and that the agrifood sector can maintain its ability to supply food to the domestic market. In the longer term, a well-functioning agrifood ecosystem will be important in improving the sector's readiness for and resilience to future pandemics and disasters. Once on the path to recovery, it will therefore be of strategic importance to promote a sustainable agrifood ecosystem by addressing some of the structural constraints that were identified before the crisis started.

Promoting greater diversification and modernization of the agrifood sector in Bangladesh will require increasing private investment both along the agrifood value chain and in support services to that chain. This will in turn require implementing the following recommendations.

STRATEGIC OPTIONS FOR GREATER ON-FARM PRODUCTIVITY

Aggregation models such as productive partnerships, contract farming, and producer groups, among others, need to be encouraged in order to facilitate economies of scale. While public extension services can encourage and promote aggregation models for achieving efficient inputs and service delivery to farmers, the private sector can also lead in the organization of such models for improving good agricultural practices, traceability, economies of scale, and so on. A review of the agricultural land rental market is also important, in order to identify private solutions for longer-term rentals of agricultural land.

Removing regulatory barriers to private sector participation in the seed market, along with increased oversight on the quality standards for seeds, is important. There is a need to review regulations that prevent private sector actors from breeding and producing the seeds for notified crops.¹ There is also a need to increase public and private coordination in order to ensure quality seed supply for notified crops. Finally, in order to stimulate farmers' demand for improved genetic materials, there is a need to increase market transparency regarding seed quality; this should in turn encourage the private sector to invest in this field.

Local GAP standards should be developed and adopted through public-private collaboration to address the misuse and overuse of certain inputs, like fertilizer and pesticides, and other food safety concerns. They should also be aligned with the need for environmental and social sustainability. Subsequently, GAPs should be the key area of focus for both public and private extension service delivery to farmers. Also, improvements to current extension services are needed in order to bring information on new techniques and innovations down to the farm level in a usable form.

Repurposing the current agricultural support policies is a key priority for agricultural diversification and modernization, especially in terms of the sector's long-term sustainability. A phased approach for reforming the policy on fertilizer and other subsidies and increasing direct support to farmers should be adopted. This will improve the efficiency of public support for agriculture and help incentivize farmers to take market-driven production decisions.

ACTIONS FOR BETTER MARKET ACCESS AND POSTHARVEST VALUE ADDITION

The development of marketing infrastructure and logistical services for agricultural supply chains should be led by the private sector. Policies and incentives that will support private businesses that are interested in taking business opportunities in such development could be implemented. A public-private partnership (PPP) framework for an agricultural marketing infrastructure (including regional market hubs, cold storages, warehouses, and cool chains, including railway cool chains) would contribute to giving the private sector greater confidence in government policies in support for the development of the marketing infrastructure.

Improvement in the regulatory and oversight system, along with support to the private sector for the adoption of appropriate food safety standards and practices is urgent. Substantial efforts in streamlining both the legal and regulatory frameworks for food safety, as well as the control and enforcement systems, are needed, ideally in close coordination with the private sector. There is also a need to support the private sector in developing harmonized, industry wide commercial standards that comply with the minimum food safety requirements for primary production and food processing. Success would be derived from the public sector supporting the harmonization process and from the public and private sectors working together to ensure close links between regulatory requirements and private standards. Also, to promote the development of more formal off-takers, such as food processing businesses and supermarkets, the public sector could support increased demand for higher quality and safer food by ensuring better enforcement of food safety standards and by promoting consumer awareness about the importance of safe food.

OTHER CROSS-SECTORAL SOLUTIONS

Some of the key cross-sectoral challenges, such as the challenging investment climate and the limited access to finance, need to be addressed in order to facilitate private investment along the agrifood value chains. Interventions to improve access to finance for agrifood value chain actors could be wide ranging; for example, there are opportunities to further develop innovative tools, such as warehouse receipt financing for postharvest financing, and addressing broader issues, like strengthening the secured transactions regime or supporting the use of rental land as collateral. Improvement in the broader investment climate and competitiveness would encourage the inflow of foreign direct investment, which would greatly benefit the agrifood sector in terms of knowledge transfers, the structuring of domestic value chains, and the ability to target and meet export market requirements.

NOTE

1. Rice, wheat, potato, jute, and sugarcane are the notified crops in Bangladesh, and these crops are considered highly important for food security.

Abbreviations

ASTI	Agriculture Science and Technology Indicators
BAPA	Bangladesh Agro-Processors Association
BARI	Bangladesh Agriculture Research Institute
BBS	Bangladesh Bureau of Statistics
BKB	Bangladesh Krishi Bank
BPC	Bangladesh Planning Commission
BRAC	Bangladesh Rural Advancement Committee
CIMMYT	International Maize and Wheat Improvement Center
DAE	Department of Agricultural Extension
EPB	Export Promotion Bureau
EU	European Union
FAO	Food and Agriculture Organization of the United Nations
FDI	foreign direct investment
FOB	free on board
GAPs	good agricultural practices
GCA	gross cultivated area
GDP	gross domestic product
ha	hectare
HYV	high-yielding variety
IFC	International Finance Corporation
kg	kilogram
MFD	maximizing finance for development
MOA	Ministry of Agriculture
MOF	Ministry of Finance
MSME	micro, small, and medium enterprises
MT	metric ton
NCA	net cultivated area
PAS	PRAN Assured Scheme
PPP	public-private partnership
PPRC-BIGD	Power and Participation Research Center and BRAC Institute of Governance and Development

R&D	research and development
RCA	revealed comparative advantage
TFP	total factor productivity
Tk	Bangladesh taka
UNCTAD	United Nations Conference on Trade and Development
USAID	United States Agency for International Development
USDA	United States Department of Agriculture
WEF	World Economic Forum
WHO	World Health Organization
WSA	water-spread area

1 Introduction

CONTEXT OF THE STUDY

Bangladesh has experienced robust and steady economic growth since 2000, with a growing role for manufacturing and services in the economy. Between 2000 and 2018, the real gross domestic product (GDP) per capita increased by 130 percent—from US\$525 in 2000 to US\$1,203 in 2018 (Hill and Genoni 2019). In the same period, the structure of the country’s economy has undergone substantial transformation. The share of agriculture in the GDP has declined by 10.8 percentage points—from 25.6 percent in 2000 to just 14.8 percent in 2017—and the shares of industry and services in GDP have increased, from 24.3 percent to 30.9 percent for industry, and from 50.2 percent to 54.3 percent for services (figure 1.1). In 2017, agriculture still accounted for 41 percent of total employment, down from 65 percent in 2000.

Despite decreases in the poverty rates in rural areas, poverty remains more pervasive in rural areas than in urban ones. The agriculture sector plays a key role in the rural economy by driving poverty reduction, creating employment for the majority of the rural workforce, and providing a large share of household incomes. Rural areas have registered impressive declines in the poverty rates in the past two decades, from 52.3 percent in 2000 to 26.7 percent in 2016 (Hill and Genoni 2019). Between 2005 and 2010, agriculture contributed 69 percent of poverty reduction nationally; the contribution was more modest in the most recent period (27 percent from 2010 to 2016). The head-count poverty rate remains markedly lower in urban areas (19.3 percent in 2016).

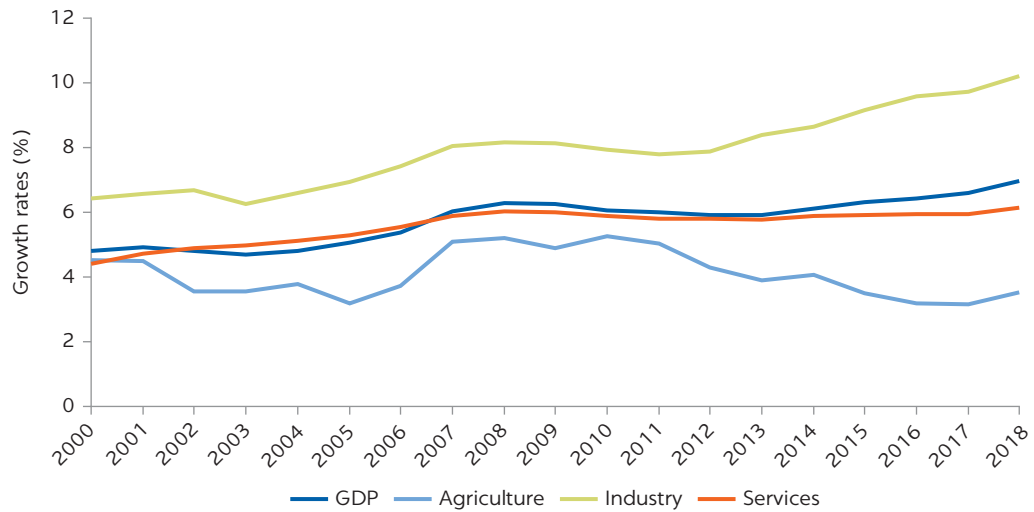
Agriculture has performed sluggishly in recent years. Since 2010, the trend of growth in agricultural output has declined consistently and has remained much lower than growth in the rest of the economy (figure 1.2). Given the high level of labor intensity in agriculture, the slowdown in agricultural growth has been one key reason for the declining role of agriculture in reducing rural poverty, and the slowdown in rural employment growth between 2010 and 2016 (Hill and Genoni 2019; Farole et al. 2017).¹ More than 24 million out of 47 million employed people in the rural areas of Bangladesh are engaged in agriculture, and the sector is the source for 38 percent of rural household incomes (BBS 2019).

FIGURE 1.1
GDP and employment shares by sectors



Sources: MOF 2019; World Development Indicators Database 2020.
Note: GDP = gross domestic product.

FIGURE 1.2
Annual trend growth rates



Source: World Development Indicators Database 2020.
Note: Dotted lines are linear trends.

The rural nonfarm economy also depends on the performance of agriculture. Evidence suggests that a 10 percent increase in agricultural incomes generates a 6 percent increase in nonagricultural incomes through strong forward and backward linkages (Gautam and Faruqee 2016). As a result, the slowdown in agricultural growth is posing a serious challenge to the rural economy generally.

Over the past 50 years, the increase in agricultural productivity in Bangladesh has led to quasi-self-sufficiency in the production of rice. In the 1970s, Bangladesh was producing 10 million tons of rice a year (Gautam and Faruqee 2016); this increased to about 37 million tons in market year 2018/19 (USDA 2019), meaning

that the country is almost self-sufficient. Through research and extension activities, investments in irrigation, and agricultural policies that are favorable to ensuring food security, the public sector has made a considerable contribution to achieving this self-sufficiency.

Food production has also started, albeit slowly, to diversify toward crops with higher profit margins for farmers, such as vegetables and maize, by responding to emerging new market opportunities on the domestic market (Gautam and Faruquee 2016). With rising urbanization and increasing incomes, Bangladesh's population is transitioning from cereals to higher-value and more nutritious agricultural commodities (Dizon et al. 2019). However, domestic production faces challenges in meeting that growing demand; thus, the agricultural trade deficit has been continuously growing over time. From 2007 to 2017, Bangladesh's agricultural imports multiplied by a factor of three, to US\$10.7 billion, with cooking oils, cereals, and sugars accounting for 60 percent of these imports. During the same period, exports decreased by 9 percent, to just US\$0.9 billion, due predominantly to a decline in fish and crustacean exports (FAO 2020). The private sector is gradually getting more involved, making significant investments in processing and improved marketing to meet growing domestic demand, as can be seen, for example, with the increase in market intermediaries along the agrifood supply chains of horticultural produce (Gautam and Faruquee 2016). However, further diversification in agricultural production and modernization along the agrifood value chain are needed in order to allow the sector to fully seize these opportunities.

Bangladesh's agrifood sector needs to overcome some critical constraints in order to realize a transition toward higher-value nutritious food products. Small farms, a limited use of aggregation mechanisms, a persistent policy focus on rice production, a weak marketing infrastructure, and costly logistics are all challenges that need to be addressed. Other challenges include the mostly informal marketing channels for food products with a limited number of established off-takers, food safety and food quality definition and enforcement issues, and vulnerability to climate shocks. The country's farms are some of the smallest in the world—the current per capita agricultural land area is less than 0.10 hectare (FAO 2020)—and there is no potential to expand agricultural lands. The sector depends on the crop subsector, which in turn is dependent on a single crop, paddy rice, which limits its potential for income generation and its role in meeting the Sustainable Development Goal of achieving nutrition security in the country. The potential for additional productivity and efficiency improvements in paddy rice is largely exhausted. Performance of the livestock subsector has not shown significant improvements in past three decades. The fishery subsector has performed remarkably well until recently, but climate events and human-induced factors such as overfishing, monofishing, and poor farming practices increasingly pose risks to its sustainability.

Bangladesh has made significant agricultural policy reforms since the 1980s that have largely contributed to the country achieving near self-sufficiency in rice production. However, these policies are also contributing to a strong bias against more diversified production. In the 1980s, reforms for agricultural input market liberalization were made, especially in regard to the use of fertilizers and irrigation. These reforms were followed by reforms in the seed sector through the National Seed Policy in the 1990s (Gautam and Faruquee 2016). However, agricultural policy support has been focused primarily on rice production,

through input subsidies and the public procurement of rice. Repurposing agricultural policy and support will be key in balancing the incentive structure across crops and promoting diversification in the sector.

Given the sector's extreme vulnerability to climate, climate change is expected to further exacerbate the challenges it is facing. Environmental degradation caused by monocropping, overuse of chemical fertilizers, and overexploitation of groundwater resources, coupled with an increase in climate events and natural hazards, pose additional risks to the sustainable development of the agrifood sector. Bangladesh is increasingly vulnerable to climate change. The existing varieties of crops are not well adapted to rising temperatures and are susceptible to increasing pressure from pests and disease (World Bank 2019). In addition, increased salinity of the soil and water due to rising sea levels is projected to result in a 15.6 percent yield reduction in high-yielding rice varieties by 2050.

Moreover, the COVID-19 crisis has hit Bangladesh's economy hard. The International Monetary Fund has projected that the economic growth of the country will be only 3.8 percent in 2020, despite an earlier projection of 7 percent (IMF 2020, table "Latest World Economic Outlook Growth Projections"). A recent study shows that, beyond the 20.5 percent of the population that is officially recognized as poor, an additional 23 percent has fallen into poverty since the COVID-19 outbreak (PPRC-BIGD 2020). According to a survey conducted by LightCastle Partners (2020), more than 80 percent of the rural low-income population experienced a decrease in earnings in March 2020. The main impacts of the pandemic on the agricultural sector are supply chain disruptions and decreasing demand. The supply chain disruptions and panic buying have led to food price hikes. In addition, with markets closed, trade disrupted, and travel limited, many producers have nowhere to sell their produce and are losing their livelihoods (box 1.1).

Given this context, the agriculture sector needs, more than ever, a balanced and forward-looking strategy for diversification and modernization. Changing consumption patterns, emerging market opportunities, and constraints related to resources and climate change must be addressed in order to facilitate postpandemic recovery in the medium term and resilience in the longer term. Given the country's limited scope for arable land expansion, and the current high level of intensity of land use, future agricultural growth will need to be driven by a combination of greater agricultural productivity, increased diversification toward high-value crops, and more integration into a modern agrifood supply chain.

Sustainable development in agriculture generally requires a mix of complementary production approaches (such as diversification, specialization, and intensification) in order to achieve greater resilience, more efficiency in the use of resources, and improved food security and nutritional outcomes (box 1.2). While all of these approaches are applicable to all of the agriculture subsectors (crops, livestock, fisheries, and forestry) in Bangladesh to various degrees, diversification is particularly relevant to the crop subsector, since it is currently dependent on a single low-value food grain, paddy rice, despite an untapped potential for diversification that could increase farm incomes, improve nutritional outcomes, and generate export earnings (Gautam and Faruquee 2016). Diversification is relevant to aquaculture too, since existing environmental and ecosystem degradation caused by monoculture and intensive production is posing risks to its sustainability. Although the potential for diversification in the

BOX 1.1

Implications of the COVID-19 pandemic for the agrifood sector

Risks related to COVID-19 remain high, with impacts on both the demand for and supply of food. The primary sources of risk are income loss and disruptions in the domestic food supply chain. Loss of income and jobs reduces people's ability to buy food. Decline in the demand for perishable goods and livestock products such as vegetables, poultry, eggs, and milk exacerbate the food security situation for the people engaged in these activities, which in turn may create future supply shortages. The government of Bangladesh has expanded the food assistance program to help the most vulnerable people.

The current crisis has led to input and labor shortages, and agricultural growth is projected to slow. Due to the restriction of movement, social distancing rules, and the disease itself, labor shortages have started to impact producers, processors, traders, and logistics companies all along the food supply chain. The enforcement of lockdowns restricted seasonal workers' movement across the country, causing disruptions in the harvesting of staple foods like maize, potatoes, boro rice, and onions. Disrupted inputs and feeds markets are expected to affect outputs and propagate further food shortages.

The pandemic has exposed the inadequate infrastructure supporting the agrifood sector. The pandemic

has laid bare some of the key constraints facing the agrifood sector, including the lack of postharvest storage, cooling technologies, processing infrastructure, and formal marketing channels. With disrupted travel and reduced demand, most farmers have experienced significant losses, especially for perishable products like vegetables, which have a short shelf life.

Going forward, it will be critical to rebuild a more resilient agrifood sector in Bangladesh. During and in the direct aftermath of the crisis, relief measures will be needed to ensure that the population can afford and can access nutritious food and that the agrifood sector can maintain its ability to supply the people with food. In the longer term, a well-functioning agrifood ecosystem will be important in order to avoid food scarcity and to enhance the resilience of the agrifood sector so that it is ready to face future pandemics and disasters. Therefore, once on the path to recovery, it will be of strategic importance to put in place policies and institutions that support a sustainable agrifood ecosystem. This will require concerted public- and private-sector efforts to address key structural constraints along the supply chain, such as food safety challenges. This report identifies and discusses these key constraints, as well as opportunities for fostering a transformation of the agrifood sector in Bangladesh.

BOX 1.2

Sustainable farming approaches

Diversification in farming refers to the reallocation of productive resources to a mix of multiple farm and postharvest value-added activities in response to both risks (climate, production, and market) and opportunities (market and technology). It is a strategy to improve sector resilience, maximize incomes, and stabilize consumption and dietary diversity. Diversification can be horizontal, vertical, or both (FAO 1998, 2001). In crop production,

horizontal diversification involves expansion by substituting or adding more crops and varieties into the existing cropping systems; vertical diversification involves expansion of the processing and marketing systems to create added value. Complementing both vertical and horizontal diversification facilitates achieving the highest returns, with greater growth impact on the overall rural economy. The benefits may vary depending

continued next page

Box 1.2, continued

on the farm's resource endowments (FAO 2001). For small, resource-constrained farms, it may help to strengthen their resilience.

Specialization in fewer commodities may offer higher returns for larger farms through higher efficiency and economies of scale (FAO 2001; World Bank 2005). At the higher scales, it can also facilitate

Source: Masyikanova 2020.

greater economic efficiency and the development of entire commodity systems (World Bank 2005).

Intensification in agriculture refers either to an increase in agricultural production per unit of inputs (land, water, labor, inputs, and time) or maintaining the same production level while using fewer inputs.

livestock subsector is relatively limited, the potential for intensification and diversification remains considerable, as in other subsectors.

Moving forward, the priority is to identify both the constraints and the opportunities for diversification and modernization of the agrifood sector in order to support more rapid agricultural growth and to promote investment in market-oriented agrifood subsectors. To achieve this, it is important to broaden the focus from only agricultural (on-farm) activities to the broader agrifood system. Productive diversification in agriculture and modernization along the agrifood supply chain will require a strategic reorientation of policies, institutions, and public investments as well as greater investment and involvement of the private sector in the supply chain and in key support services. For such strategic repurposing of public support for agriculture, it is important to better understand the business opportunities and constraints that private investors are facing along the agrifood value chain, and to identify the most effective set of policies and public investments for enabling a diversified and modernized agrifood sector across all of the sector's products in support of growth, employment, and ultimately, nutrition security in Bangladesh.

TRANSFORMATION OF THE AGRIFOOD SYSTEM: WHERE DOES BANGLADESH STAND?

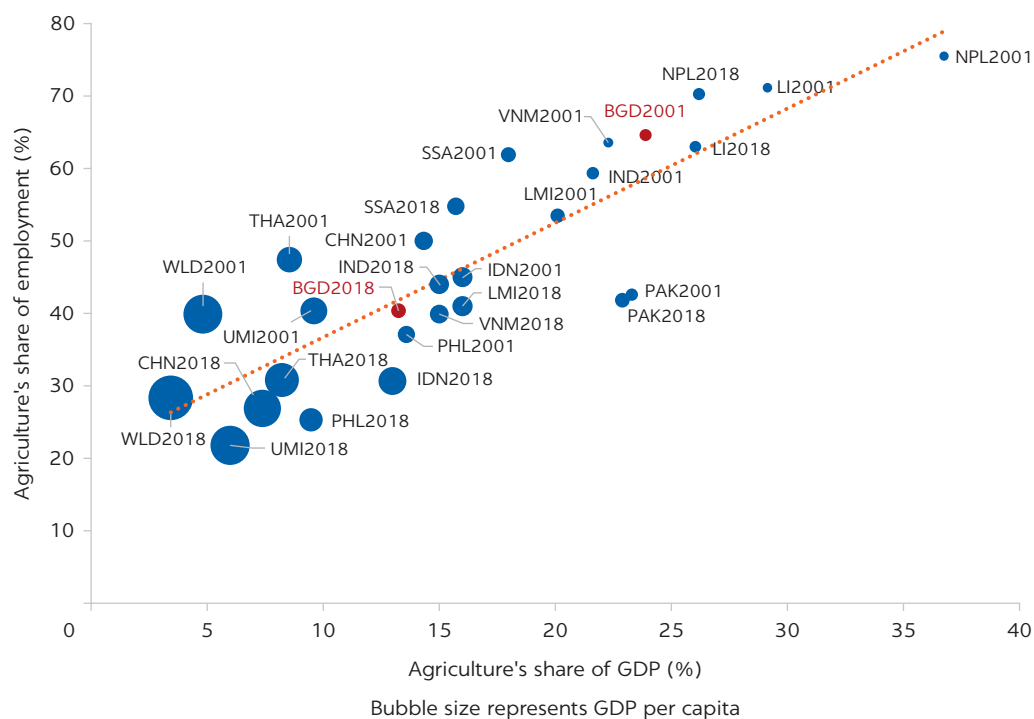
Since late 1990s, Bangladesh has moved from an agriculture-based economy through a transformational stage and is now heading toward a more urbanized economy. In general, as economies grow, the shares of agriculture in GDP and employment tend to decline, but the decline in the employment share is generally slower than the decline in GDP. Because the level of income varies across countries, the level of structural transformation does as well. The *World Development Report 2008: Agriculture for Development* classified countries into three groups based on their level of economic transformation: (1) *agriculture-based countries*, in which agriculture contributes significantly to GDP and the poor are concentrated in rural areas; (2) *transforming economies*, in which agriculture contributes less to GDP but poverty remains largely rural; and (3) *urbanized economies*, in which agriculture plays only a small role in the economic GDP and poverty is no longer a rural phenomenon (World Bank 2007). Reviewing the data

from 2001 through 2018, these patterns of economic transformation are being observed in many countries in Asia and Africa, and since 2001, the shares of GDP and labor in agriculture have declined by varying degrees in many countries (figure 1.3). In most countries, the transition stage is marked by a decreasing percentage of people working on the land, more professional and larger farming units, increased agricultural sophistication and mechanization leading to increased value addition, and greater awareness of the importance of food safety and exports, especially of processed goods.

Bangladesh has experienced a rapid transformation over the past 18 years compared to other countries in South Asia and has now entered the stage in which major Southeast Asian countries found themselves in 2001. In Bangladesh, the majority of rural people are still engaged in agriculture and poverty remains largely a rural phenomenon, although agriculture accounts for only a small share of GDP.

As the economy continues to transition toward a more urbanized economy, the off-farm aspect of the agrifood sector will expand, and the share of agrifood manufacturing and services will grow. Therefore, more jobs are expected to be created in the downstream activities of the agrifood supply chain, and the labor share in agriculture will gradually decline over time. Urbanization and per capita income growth typically offer significant new opportunities, with increased demand for diversified high-value agricultural products and the resulting creation of new jobs within the sector, beyond the farm (Townsend et al. 2017). Such patterns have already been emerging in Bangladesh, and the job dynamics

FIGURE 1.3
Share of employment and GDP in agriculture



Source: World Development Indicators Database 2020.

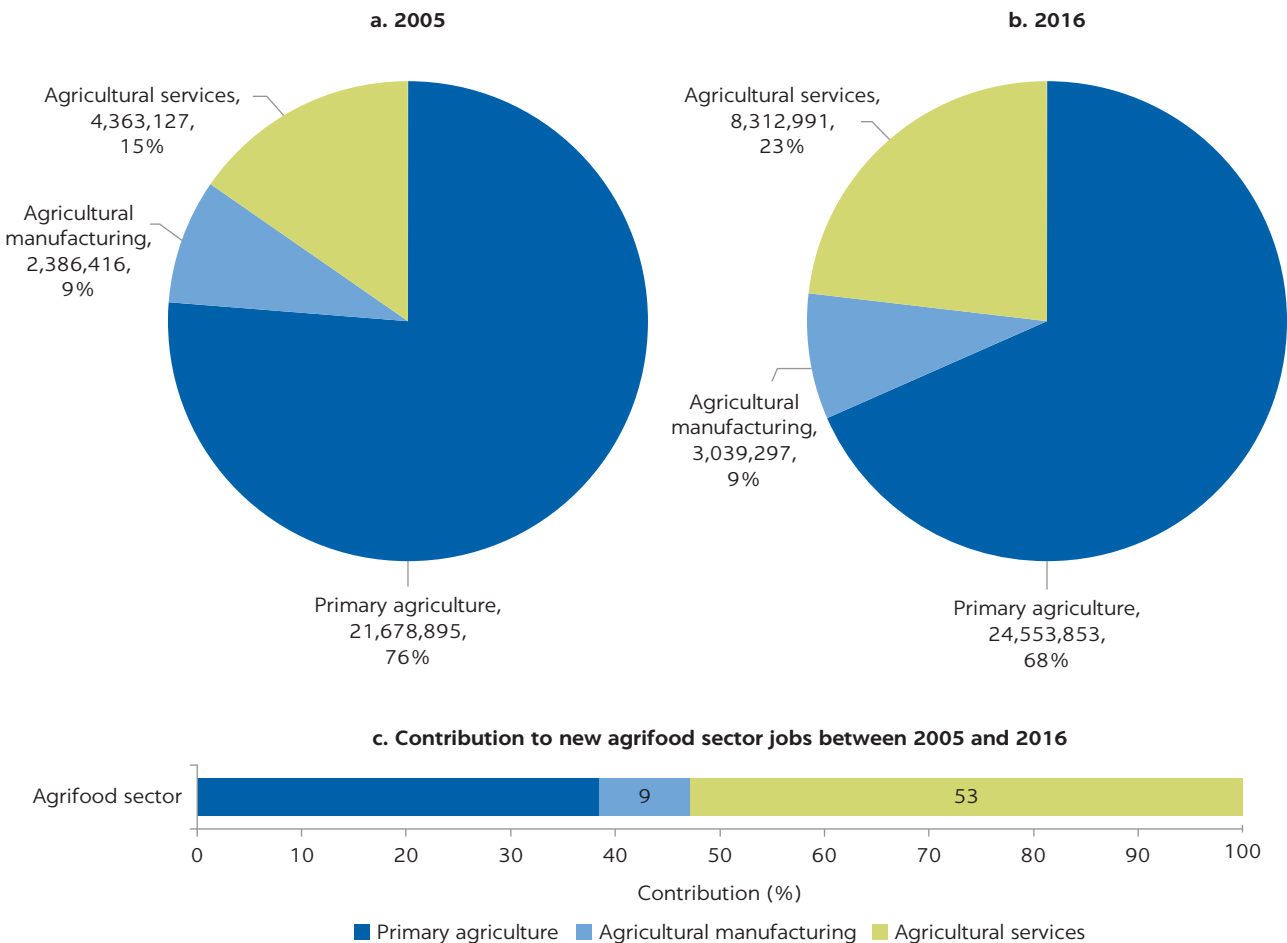
Note: BGD = Bangladesh, CHN = China, IDN = Indonesia, IND = India, NPL = Nepal, PAK = Pakistan, PHL = Philippines, SSA = Sub-Saharan Africa, THA = Thailand, VNM = Vietnam, and WLD = world. LI = low income, LMI = lower middle income, and UMI = upper middle income. GDP = gross domestic product.

in the agrifood sector between 2005 and 2016 offer some insight into the transition happening in the agrifood sector.

While primary agricultural activities still dominate jobs in the agrifood sector—68 percent of jobs in the sector are in primary agriculture—the majority of new jobs are being created in off-farm activities. Between 2005 and 2016, 7.5 million new jobs—from 28.4 million in 2005 to 35.9 million in 2016—were created in the agrifood sector, of which 53 percent were in agricultural services, and another 9 percent in agrifood manufacturing (figure 1.4.). However, primary agriculture continues to accommodate new workers (38 percent of new jobs) and accounts for more than two-thirds of the workers in the agrifood sector. These numbers show that the agrifood sector in Bangladesh is transitioning, albeit slowly, toward an agrifood system where more jobs come from downstream activities in the value chain.

With the country’s economy in transition, expanding opportunities for the manufacturing and service components of the agrifood value chain in Bangladesh will require identifying and addressing the market failures and major constraints that are preventing agribusinesses and private actors more generally from fully materializing the development potential of the sector. Market failures along the value chain are often exacerbated by poor performance of support services and

FIGURE 1.4
Distribution and changes in agrifood sector jobs between 2005 and 2016
 Number, percentage share



Sources: BBS 2007, 2017.

a weak business climate; these challenges need to be addressed in order to attract private investment along the value chain, in line with the maximizing finance for development (MFD) framework.

East Asian and Southeast Asian countries offer good lessons for Bangladesh's agrifood transformation process. So far, Bangladesh has followed a trend similar to those of most Southeast Asian countries, which have managed to transition from being dependent on agriculture to becoming major global industrial and service hubs. These countries have achieved rural economic development that is driven mainly by increased on-farm productivity and better commercialization of agricultural products. This development was typically done in two phases: first, the intensification of rice production to achieve self-sufficiency in ensuring food security and increasing agricultural incomes, and second, diversification of the agriculture sector by expanding production to include high-value crops and increasing value-adding activities to serve both domestic and international markets. To do this, agricultural diversification policies were complemented with the development of postharvest systems such as storage, processing, and other value-adding activities; transportation; and marketing, as well as strengthening institutions to help link farmers to remunerative markets.

Such transformation processes were observed in both China and Japan in the early stages of their development. China developed smallholder-based farming technologies and developed new crop varieties with high yields, high quality, early maturity, and greater adaptability. Japan adopted an agricultural act that stipulated a mechanism for transforming the agricultural product mix. The government also implemented appropriate measures for diversifying and selectively expanding the production of crops, with expected higher demand driven by envisioned changes in dietary habits. Between the 1960s and 2000s, the per capita consumption of rice and starchy foods in Japan decreased sharply, while that of fresh vegetables and fruits, eggs, and milk increased substantially. The government proactively supported the development of related infrastructure and support services, which increased domestic market access and attracted many farms to shift to production of these high-value products (Ito 2015; Pingali 2006).

Bangladesh seems to be experiencing a similar turning point, and there is a need to develop a conducive environment for realizing the full potential that can be achieved through diversification. With Bangladesh now realizing near self-sufficiency in rice production, the acceleration of rural growth will be stimulated by diversifying to high-value products and developing nonfarm rural commercial activities. However, in many countries, agricultural transformation has been delayed or has stagnated; it is important for Bangladesh to get it right in order to leverage its potential to realize middle-income status.

OBJECTIVES OF THE REPORT

Agriculturally, Bangladesh is now in a transitional stage. It needs to build on the fundamentals that have been established and create a more modern, more sophisticated sector that creates off-farm revenue and jobs, feeds an increasingly urbanized population, and expands agricultural exportation. To effectively pursue this agenda, a better understanding is required of the business opportunities and constraints facing agribusinesses and private investors along the agrifood

value chain. Moving ahead, Bangladesh needs to realign its agricultural policies in order to make the agrifood sector more diverse and modern, while keeping a balanced approach toward food security.

The overall aim of this report is to identify policy and public investment opportunities for increasing agricultural diversification in Bangladesh and creating an enabling business environment for private-sector investment along the agrifood value chain, using the MFD framework. Hence, the report identifies critical policies, institutions, and public investment options that would promote agricultural diversification and enable private investment to modernize the sector's value chain, with the ultimate goal of supporting both farm and off-farm incomes, as well as the country's nutrition security.

This report is intended to provide guidance to the government of Bangladesh for implementing and operationalizing the strategic priorities of agricultural diversification and commercialization, as outlined in its National Agricultural Policy 2018, in order to improve farm incomes, create rural jobs, and attain nutrition security. It is also intended to inform the World Bank's strategies and dialogue for agricultural and rural development in Bangladesh and sharpen priorities for future engagement on agrifood sector modernization initiatives.

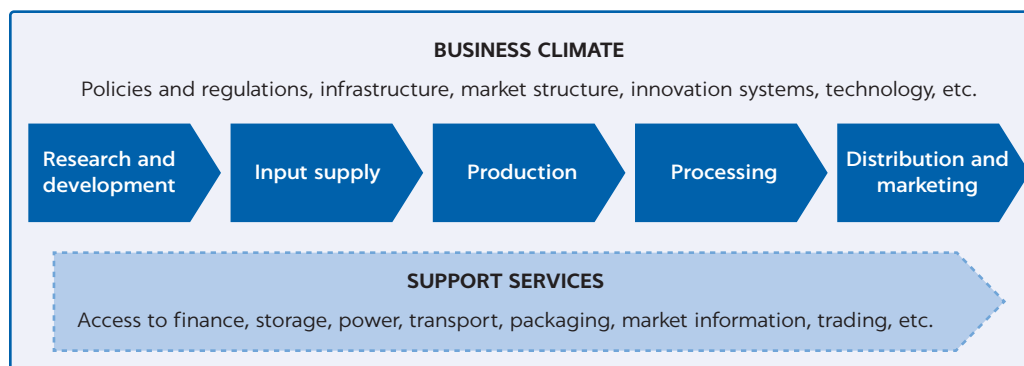
ANALYTICAL APPROACH AND DATA

The report used the agrifood sector ecosystem framework, which is cognizant of the evolving consumer demand, emerging disruptive technologies, and new business models as well as the challenges and opportunities they create within the system. These trends are transforming both agriculture and the agribusiness markets and are requiring both public and private parties to adapt and build their capabilities for responding to consumer demand. In addition, as Bangladesh's structural transformation continues to progress, the role of agribusiness in supporting all other sectors becomes more essential.

To explore the policies and investment opportunities needed to boost agricultural diversification and modernization in Bangladesh, this report has adopted a multipronged approach. The study used both primary and secondary qualitative and quantitative data to analyze the constraints and opportunities for agricultural diversification. Analysis of secondary macro- and microdata provided insight into key aspects of the country's agriculture sector's performance as well as challenges in the agrifood ecosystem (figure 1.5).

Following this framework, the report assessed and discussed the performance of various nodes along the agrifood value chain, the performance of key support services, and the business climate as it relates to the agrifood sector, in order to identify potential constraints as well as opportunities for increasing private investment and promoting diversification and modernization of the sector toward a more sustainable and inclusive transformation in the country. The microlevel findings discussed in this report are based on in-depth analyses of microlevel data from (1) the Household Income and Expenditure Surveys conducted by the Bangladesh Bureau of Statistics (BBS) in 2000 and 2016, (2) the Agriculture and Rural Survey conducted by BBS in 2018, (3) the 62-village panel survey data conducted by Bangladesh Rural Advancement Committee,

FIGURE 1.5
The agrifood sector ecosystem



Source: World Bank 2018.

and (4) market price information from the Department of Marketing of the Ministry of Agriculture.

To ground the policies in specific contexts, three subsector analyses, informed by field visits and stakeholder consultations, were conducted. The consultations were organized with various agents along each subsector's value chain, including policy makers, farmers, traders, and processors. Additional consultations were arranged with policy makers in relevant ministries. At the policy level, various cross-cutting issues were analyzed, and investment opportunities that have a high potential for unlocking agricultural diversification and modernization were identified.

STRUCTURE OF THE REPORT

Chapter 2 provides a detailed analysis of agricultural performance and transformation in Bangladesh in past decades and focuses on the country's opportunities for productive diversification in agricultural development, as well as improved nutrition in the context of changing diets and rising urbanization. Chapter 3 discusses key challenges and constraints along the agrifood value chain that need to be tackled in order to support the sector's diversification and modernization. Chapter 4 presents an assessment of three products, one each from the fruits, vegetables, and livestock feed subsectors, and their value chains to illustrate the types of challenges and constraints discussed in chapter 3. Chapter 5 provides priority recommendations, especially in relation to strategic priorities for public investment and policies to mobilize private-sector investment along the agrifood value chain.

NOTE

1. While the rural economy of Bangladesh added about 5.6 million additional jobs between 2005 and 2010, it was able to add only 1.3 million additional jobs in the next six years (BBS 2017). Currently, about 5.5 million people, around 13 percent of the entire rural workforce, are looking for jobs and employment opportunities.

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2 Agrifood Sector Transformation in Bangladesh

INTRODUCTION

Successful transformation of the agrifood system depends on the availability of opportunities for agricultural diversification both horizontally (for example, by growing more high-value agricultural commodities) and vertically (by postharvest processing and other value-adding activities). Perceived market opportunities for productive diversification exist when considering the growing domestic market for high-value food products. With growing affordability and increased consumer awareness, the demand for nutrient-dense, high-value agricultural commodities has been consistently growing, and the existing agrifood production system faces challenges to meet this demand. This is reflected in the country's growing deficit in agricultural trade. The potential for increasing exports appears to be more limited.

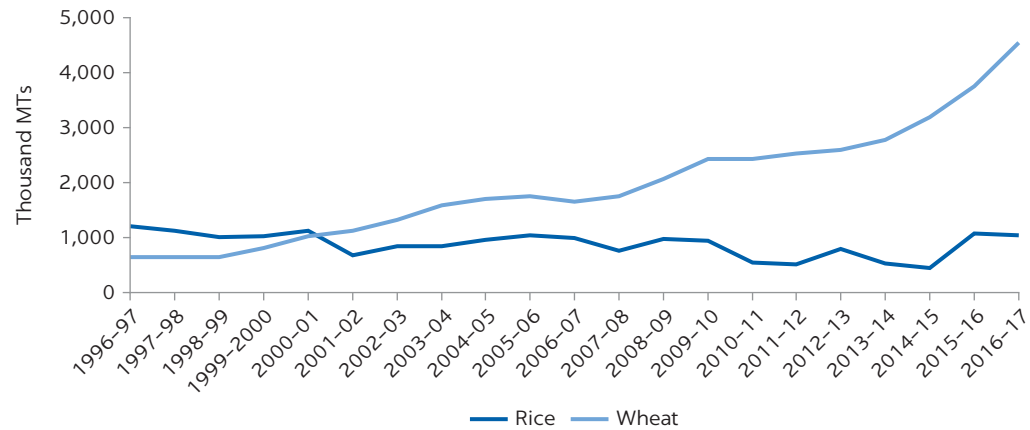
This chapter reviews past performance of the sector through the lens of diversification and discusses both market and agroecological opportunities for diversification that could be exploited in order to increase farmers' incomes and move toward attaining nutrition security in the country. (Chapter 3 will discuss the key constraints preventing market actors from seizing these opportunities.)

AGRICULTURE AND ITS PAST PERFORMANCE: SELF-SUFFICIENCY IN RICE PRODUCTION

Since the late 1990s, Bangladesh's agriculture sector has undergone a profound transformation and achieved laudable success in attaining near self-sufficiency in rice production, which is its main staple. Total rice production doubled, from 17.7 million metric tons (MTs) in 1995–96 to 36.2 million MTs in 2017–18, and importation of rice went down slightly in the same period. However, the importation of wheat has been consistently growing over time, from 0.5 million MTs in 2000–2001 to 5.6 million MTs in 2018–19 (figure 2.1).¹

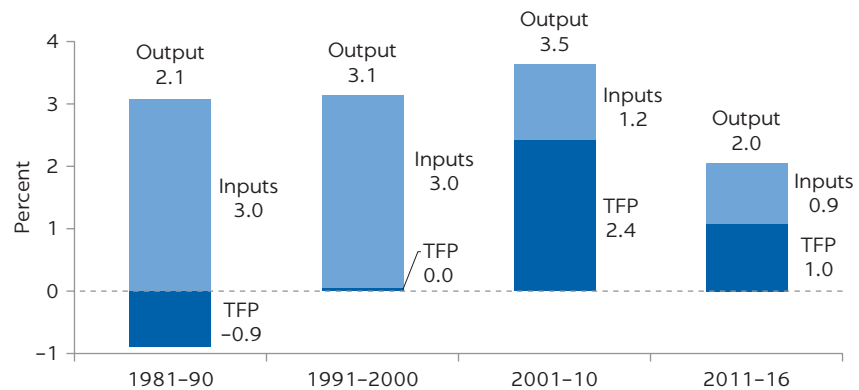
The increase in rice production was achieved in great part thanks to the government's agricultural policies focused on food security, as well as on public investment that supported intensification, the expansion of irrigation, and the

FIGURE 2.1
Importing of cereals (five-year moving average)



Source: MOF 2019.
 Note: MT = metric ton.

FIGURE 2.2
Inputs, TFP, and output growth, 1981-2016



Source: USDA 2019a.
 Note: TFP = total factor productivity.

introduction of new high-yielding varieties (HYV) of rice. This support helped to create a consistent increase of rice yield over time.

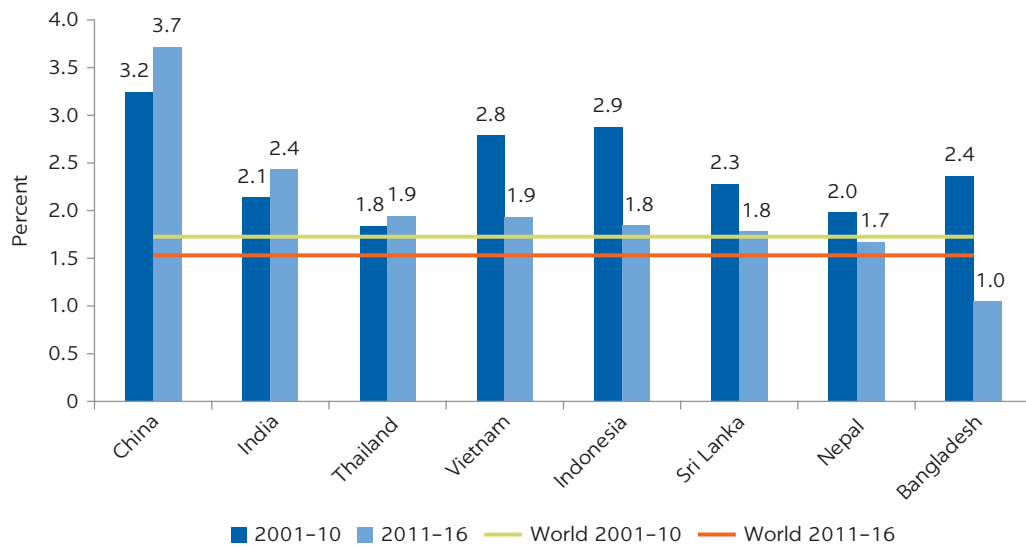
Since 2010, however, agricultural growth has slowed, and the average growth rate declined to less than 3 percent for 2011-17, down from more than 5 percent in 2000-2010.

The slowdown in the agricultural sector's growth is mainly driven by a recent decline in its growth in total factor productivity (TFP), along with a continuous decline in the growth of the use of inputs since the 1990s. The evidence shows that the annual growth of input use decreased to 0.9 percent from 2011 to 2016, down from its levels of 3 percent in 1991-2000 and 1.2 percent in 2001-10. The agricultural TFP growth has declined substantially, from 2.4 percent in 2001-10 to 1.0 percent in 2011-16 (figure 2.2). To put this sectoral performance into context, the average annual growth of agricultural TFP in Bangladesh was the highest in South Asia between 2000 and 2010, and was comparable with the agricultural TFP growth in many middle-income countries in Southeast Asia,

including China, Indonesia, Thailand, and Vietnam (figure 2.3). While many of these countries have experienced such a decline in growth since 2010, the decline in Bangladesh was much sharper.

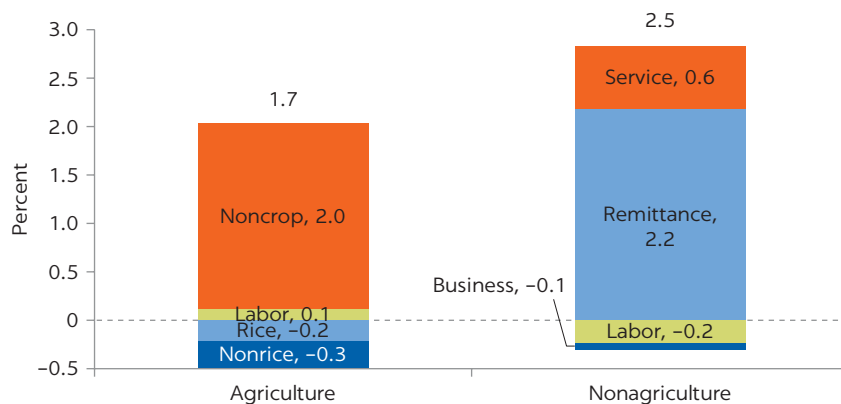
Nevertheless, agriculture continues to contribute to rural household incomes, and plays an important role in providing livelihoods and jobs to the rural poor. An examination of household income growth² between 2000 and 2014 indicates that agriculture contributed, on average, 40 percent (1.7 percentage points) of the per capita income growth of rural households (4.2 percent annually) (figure 2.4). At the subsector level, noncrop agriculture was the second highest contributing subsector across the farm and nonfarm economy, just after remittance earnings. Crop agriculture was not an important contributor to rural income growth, despite the fact that the majority of the country’s farmers are engaged in crop farming.

FIGURE 2.3
Agricultural TFP growth among Asian countries



Source: USDA 2019a.
Note: TFP = total factor productivity.

FIGURE 2.4
Decomposition of annual income growth (4.2 Percent), 2000-14



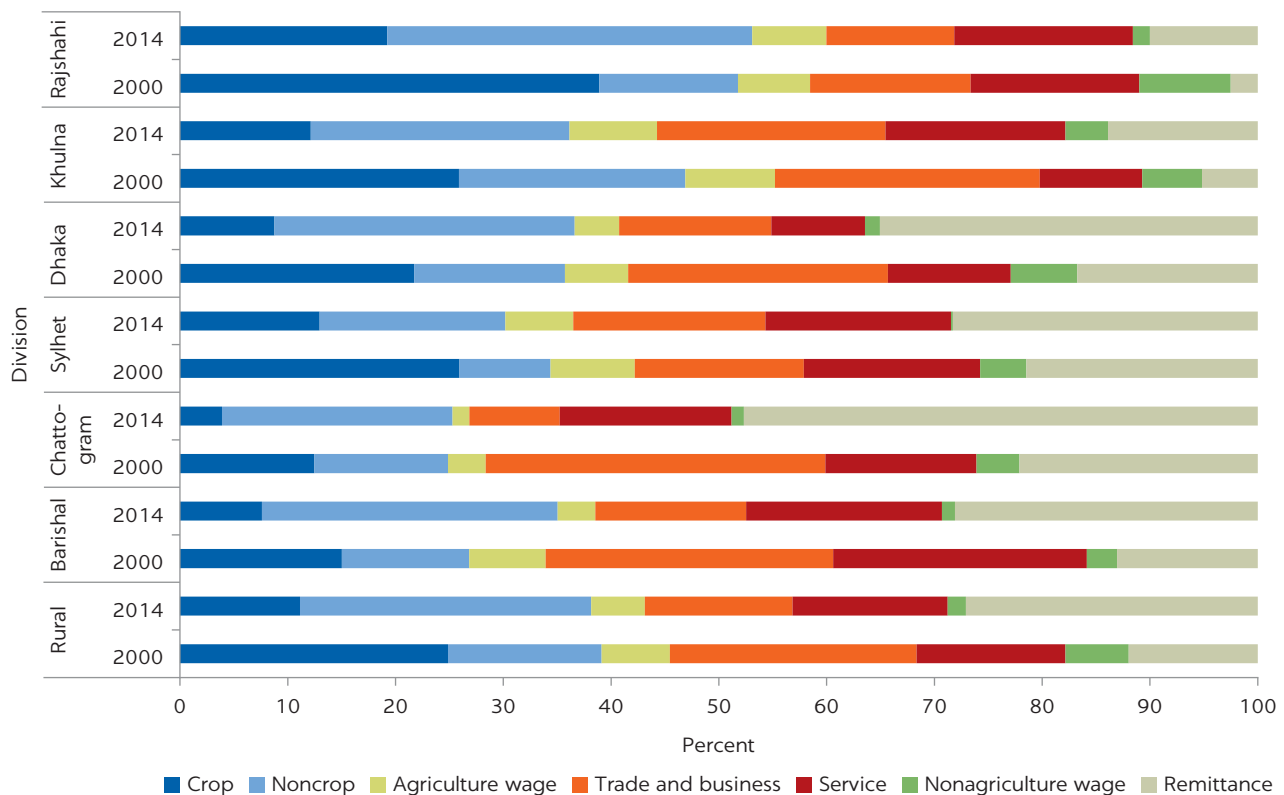
Source: Ahmed and Gautam 2020.

The rural economy and Bangladesh’s agriculture sector are in a transitional stage, and the role of primary agriculture in the national gross domestic product (GDP) and the level of rural household income is declining. Figure 2.5 presents the composition of rural household incomes in 2000 and 2014 at the divisional level and highlights the growing role of noncrop agriculture and remittance earnings in rural incomes across the country. While the share of income from agriculture still remains high in most divisions, it declined in all of the divisions except Rajshahi.³

The agricultural sector is dominated by the crop subsector, and within the crop subsector by one crop, paddy rice. This dependence on monocropping increases the sector’s already high vulnerability to natural hazards and the increasing occurrence of adverse climate events. From 2000 to 2017, the crop subsector underperformed in comparison with other subsectors, with the lowest annual subsector growth rate of 2.9 percent on average, whereas the livestock subsector grew at 3.9 percent, slightly lower than the sectoral average growth rate of 4.1 percent (table 2.1). In stark contrast, the fisheries and forestry subsectors grew by more than 5 percent per annum throughout the period. Yet the crop subsector accounts for more than half of agricultural GDP. It is important to note that the agriculture sector performed very well in the first decade of the 2000s, and average growth was higher than the overall GDP growth between 2000 and 2005.

Agricultural growth in past decades was mainly driven by the expansion of access to irrigation, the use of fertilizers and machinery, and the introduction of new HYV rices, especially in the face of a continued decline in cropland per agricultural worker. Since 1981, the amount of cropland per agricultural worker

FIGURE 2.5
Changes in shares of rural household incomes, 2000–2014



Source: Ahmed and Gautam 2020.

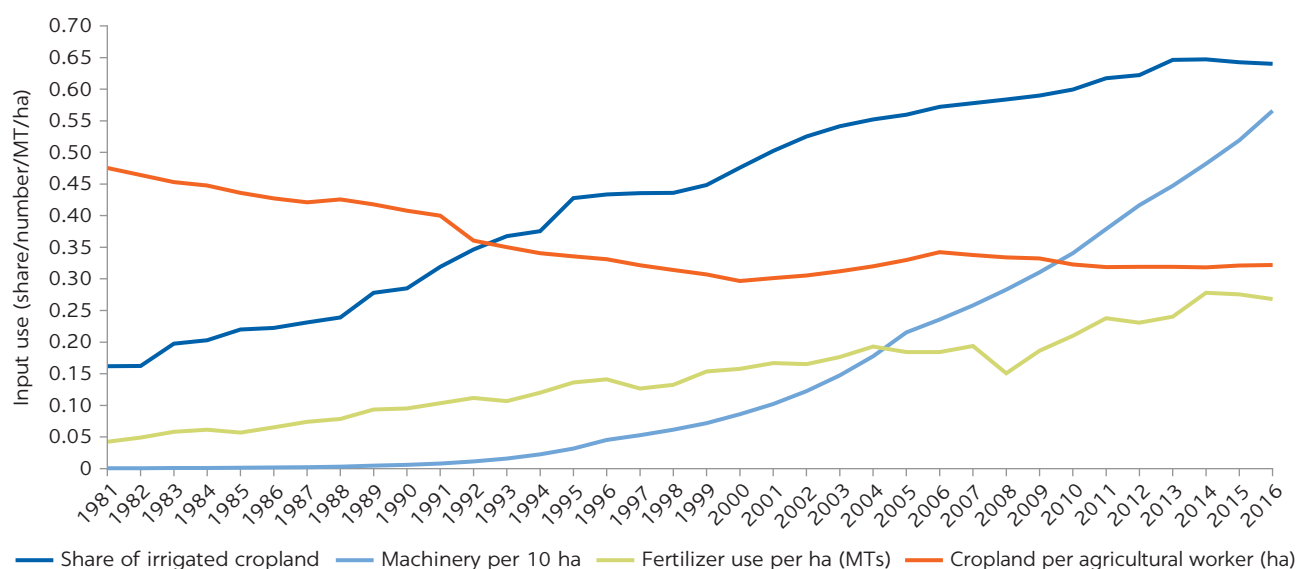
Note: Recently, the government of Bangladesh changed the English spelling of two administrative divisions—Barishal and Chattogram.

TABLE 2.1 Annual growth of GDP (period averages at constant prices) and sectoral share of GDP

Sectors	ANNUAL GROWTH OF GDP (%)				SECTORAL SHARE OF GDP (%)	
	2000–05	2006–11	2012–17	2000–17	2000	2017
National	5.0	6.1	6.6	5.9	100	100
Agriculture, forestry, and fisheries	5.6	5.1	3.2	4.1	25.6	14.8
Crops and horticulture	2.6	4.4	1.7	2.9	14.6	7.9
Livestock	4.6	3.6	3.0	3.7	3.0	1.6
Forestry	4.6	5.1	5.3	5.0	1.9	1.7
Fisheries	2.7	4.7	6.1	4.5	6.1	3.6
Services	4.9	5.9	6.1	5.8	50.1	54.3
Industry (including construction)	5.7	8.1	9.6	8.4	24.3	30.9

Source: Masyllkanova 2020.

Note: GDP = gross domestic product.

FIGURE 2.6**Changes in agricultural inputs use, 1981–2016**

Source: USDA 2019a.

Note: MT = metric ton; ha = hectare.

declined by 33 percent—from 0.48 hectares in 1981 to 0.32 hectares in 2016 (figure 2.6). On the other hand, the use of irrigation, fertilizers, and agricultural machinery increased substantially over the same period. The growth of irrigation and fertilizer use, however, has slowed in recent years. The rapid increase in the use of agricultural machinery indicates that the sector is moving toward a more modernized phase.

Persistent support for agriculture and a strategic focus on ensuring food security have facilitated the achievement of near self-sufficiency in rice production, but it has also created a bias against other high-value agricultural commodities.⁴ The success in tripling rice production since the 1980s was mainly driven by successive agricultural policy reforms and a persistent focus on increasing rice production in the country. While empirical measurements to explain the drivers for the increase in rice production are rare, key reforms in agricultural input

markets have facilitated the rapid expansion of irrigation through groundwater pumps; increased participation of the private sector in the fertilizer and seed markets; and rapid expansion in agricultural mechanization through the use of power tillers (Gautam and Faruqee 2016). Food security remains at the center of the government’s agricultural strategies, and it continues to maintain incentives for rice production through input subsidies, output price support, and price stabilization. Between 2012 and 2014, agricultural subsidies accounted for 80 percent of the total recurrent public expenditure for the agriculture, livestock, and fisheries sectors (World Bank 2015). For example, the agricultural subsidy in 2017–18 was estimated to be around US\$1.1 billion (MOA 2019). This emphasis on food security through the increased domestic production of staples has created a bias against more diversified production systems and has slowed the progress of diversification. Moving forward, creating a balanced incentive structure across crops is important in order to promote productive diversification and bring private investments into the agrifood value chain.

AGRICULTURAL DIVERSIFICATION IN BANGLADESH: PAST TRENDS AND PATTERNS

Agricultural production in Bangladesh is very concentrated on the production of paddy rice. Three-fourths of the country’s cropland is planted with cereals (figure 2.7). Rice paddies represent 71 percent of the production area, and 59 percent of total crop value. Potatoes generate the second-highest crop value (9.5 percent). Fish and crustaceans generate 73 percent of total animal production value, with aquaculture generating 68 percent of fish value and goat generating the second-highest meat value (6 percent).

Agricultural diversification within each subsector

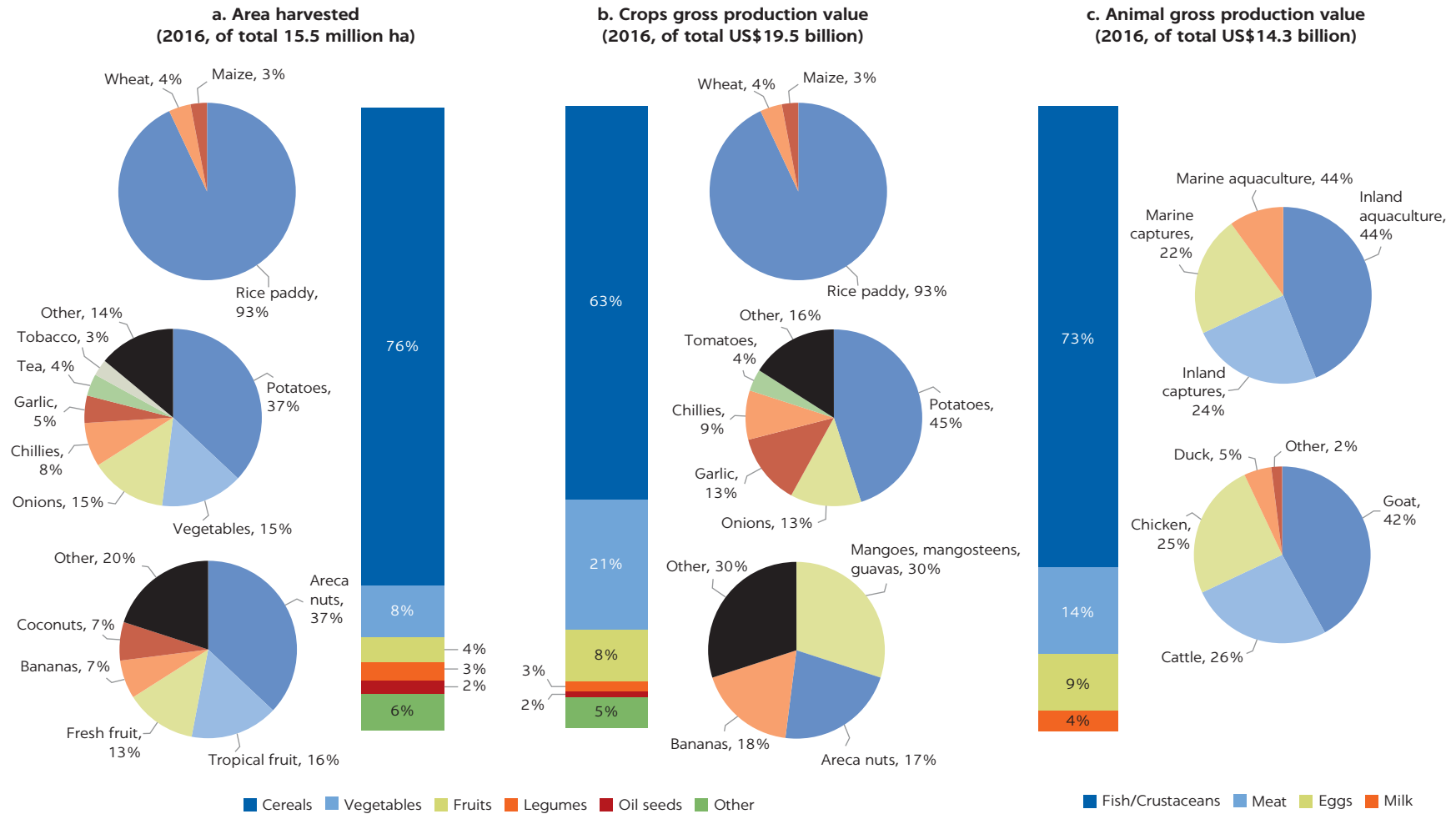
Crops

The crop subsector is dominated by paddy rice, which occupies around 11.6 million hectares or 77 percent of the country’s gross cultivated area (GCA). It is produced in three seasons: *aman* (monsoon), *boro* (winter), and *aus* (spring). Boro paddy rice accounts for 53 percent of the rice produced and 41 percent of GCA. It is followed by aman paddy (40 percent of output and 50 percent of GCA), and aus paddy (6 percent for both output and GCA) (figure 2.8). The total amount of rice produced in Bangladesh has more than doubled since 1995—from 16.8 million MTs in 1994–95 to 36.3 million MTs in 2017–18 (MOF 2019). Boro rice was the major contributor to this impressive growth in production. Its production tripled over the period, while the production of aus rice and aman rice increased by 51 percent and 65 percent, respectively.

A considerable gap still exists between attainable and actual yields in paddy rice production, despite a very high level of adoption of HYVs and hybrid seeds (99 percent in boro, 75 percent in aman, and 79 percent in aus rice). The Bangladesh Rice Research Institute has estimated the yield gaps to be in the range of 25 percent for boro and 75 percent for aman and aus paddy rice (Gautam and Faruqee 2016). Potential for reducing the yield gap exists at the farm level, especially for boro rice, if underlying causes were to be addressed. These causes are (1) the overuse and imbalanced use of fertilizers, resulting in declining soil fertility; (2) a lower level of adoption of technology in raising aman and aus due

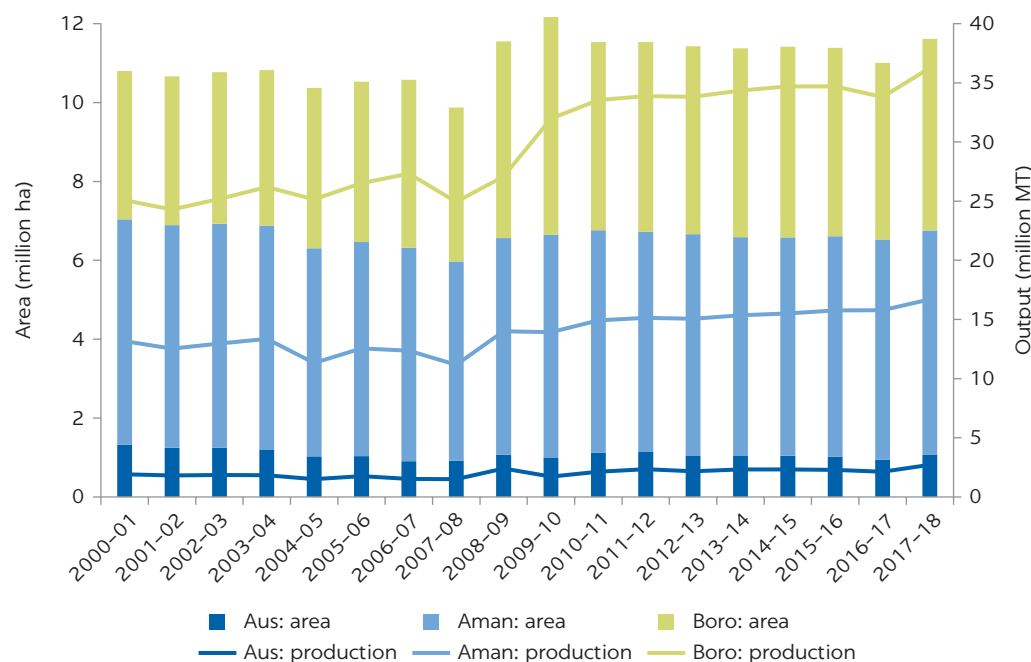
FIGURE 2.7

Crop and animal production in Bangladesh



Source: FAO 2020.
Note: ha = hectare.

FIGURE 2.8
Paddy area and output, FY2000/01–FY2017/18



Source: Masykkanova 2020.

Note: FY = fiscal year; ha = hectare; MT = metric ton.

TABLE 2.2 Diversification and its sources, 2000–2016

	2000–2005	2006–2011	2012–2016
Simpson's Diversity Index	0.29	0.31	0.35
Sources of diversification			
Cropping intensity	0.00	72.07	17.70
Crop substitution	100.00	27.93	82.30

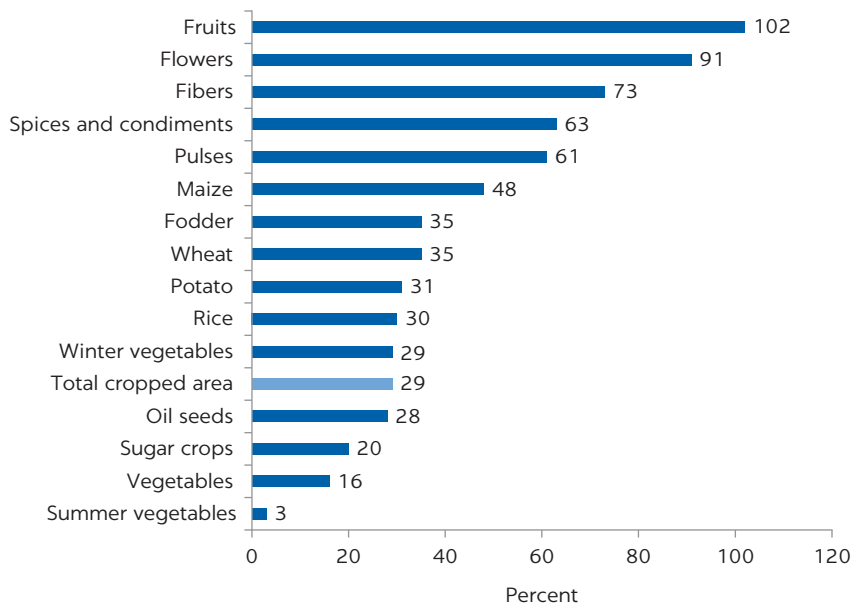
Source: Masykkanova 2020.

to flooding risks; (3) inadequate farming knowledge and inefficient practices; and (4) crop pests and disease (BPC 2018; Gautam and Faruquee 2016).

Since 2000, the crop subsector has experienced gradual diversification toward nonpaddy crops through crop substitution and intensification (table 2.2). Major floods in 1999, 2004, and 2005 caused a considerable decline in the production of all crops. Yet there was a substantial shift toward horticulture through the substitution of oil crops, pulses, and fibers. From 2006 to 2011 the trend continued, but this was through both intensification (72 percent) and crop substitution (28 percent). The trend was reversed from 2012 to 2016, during which period crop substitution—mainly the substitution of cereals and fibers for other crops—became the major source of diversification (82 percent), followed by intensification (18 percent).

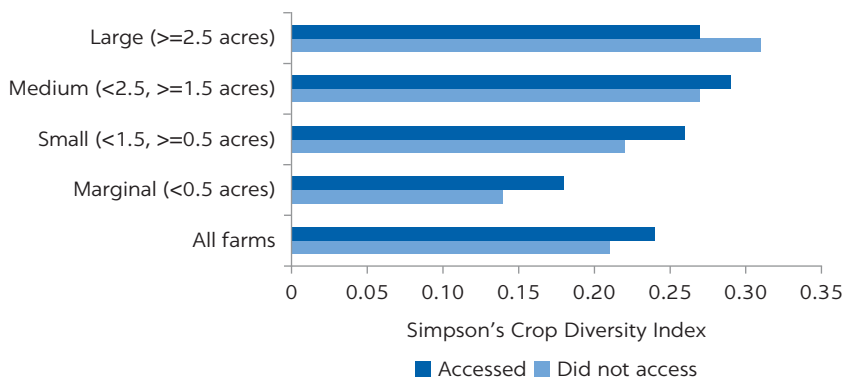
The gradual move toward diversification of the sector has also been observed from changes in the areas under major crop groups between 2008 and 2018 (figure 2.9). During this period, the areas cultivating fruits, flowers, fiber, spices, and pulses increased more than 60 percent, while the total cropped area increased by 29 percent. This implies that there has been a large expansion of

FIGURE 2.9
Change in crop areas, 2008–18



Source: Hoque and Ahmed 2020.

FIGURE 2.10
Access to irrigation and crop diversification index, by farm size



Source: Hoque and Ahmed 2020.

areas cultivating these high-value agricultural commodities. The areas growing maize, fodder, and wheat have also increased at a higher rate than the increase in total cropped area. However, the share of areas growing these high-value crops remains low. Moreover, a worrying trend is that the area cultivated with vegetables experienced much slower growth than that of the total cropped area.

The positive change toward high-value agricultural products was primarily driven by increased availability of high-quality and modern seed varieties, which resulted from liberalization of the seed sector in the late 1990s, and steady expansion of irrigation facilities across the country. While farms with access to irrigation are generally more diversified, irrigation is also strongly associated with the level of diversification among marginal, small-, and medium-size farms (figure 2.10). The government has initiated another import substitution policy, aiming to reduce dependence on the importation of

oilseeds, pulses, and spice crops, including through the provision of a short-term loan facility at subsidized rates. The latter policy is also aimed at addressing groundwater depletion. These policies have facilitated sharp increases in the production of the targeted crops.

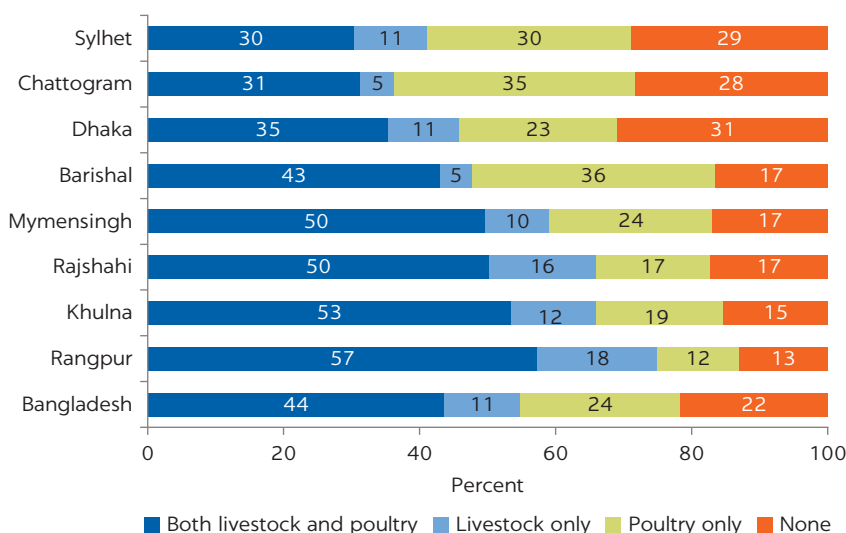
Livestock

With the exception of poultry, livestock farming is largely practiced by small-holder farmers; it has low productivity and relatively slow growth compared to other subsectors. Performance in this subsector has been poor since 2000 and, even with some improvements since 2012, the compounded annual growth in milk productivity was negative (-1.5 percent from 2000 to 2016) and productivity growth in goat, sheep, buffalo, and cow meat was broadly flat (Masykkanova 2020). Since this subsector's growth has been slower than population growth in recent decades, the country has seen an increase of imports. In fiscal year (FY)2015/16 alone, the country spent around US\$249 million for imports of dairy products.

In terms of diversification, only the poultry subsector has shown any real dynamism in recent years, with the expansion of commercial poultry production. From 2001 to 2011, broiler meat production and egg production, respectively, grew 8.8 percent and 7.7 percent annually (Hamid et al. 2017).

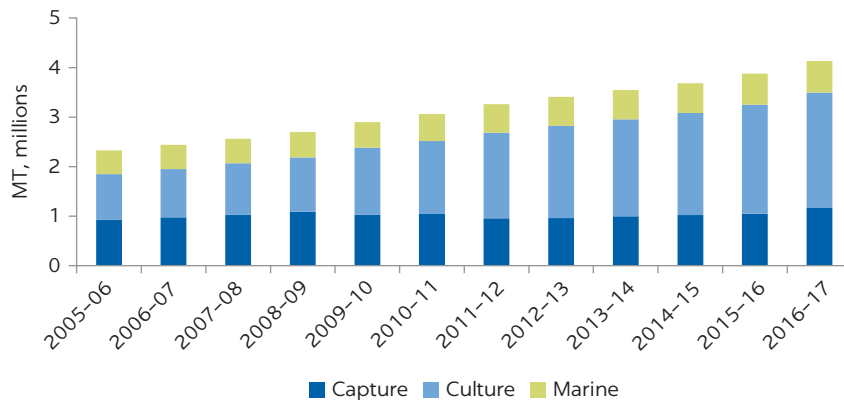
Nearly 80 percent of rural households are engaged in either livestock or poultry production, although mostly for their own consumption (figure 2.11). The engagement of rural households in livestock production is higher in the Khulna, Rangpur, and Rajshahi divisions, where poverty rates are higher. Recognizing its important role in the rural economy, the World Bank is supporting this subsector with US\$500 million in investments, which are expected to foster a market-led transformation of the subsector by promoting modern technology, encouraging private-sector investments along the value chain, and improving the overall ecosystem for value chain development through support for key infrastructures—markets, access to markets, access to insurance and financial products, livestock services, and capacity building and knowledge base development.

FIGURE 2.11
Share of rural households engaged in livestock and poultry production (percent)



Source: BBS 2019.

FIGURE 2.12
Fish and shrimp production, FY2006/07–FY2016/17



Source: Masyilkanova 2020.
 Note: FY = fiscal year; MT = metric ton.

Fisheries

The fisheries subsector is a private sector-led diversification success story, with Bangladesh having become the world's third largest producer of inland capture, and fifth in inland culture fisheries (FAO 2018). The country has massive marine, coastal, and inland water resources for fish production. Within the subsector, inland capture fishery is the largest industry, accounting for 56 percent of total production, and 3.91 million hectares of water-spread areas (WSA) (figure 2.12). Inland aquaculture is the second largest, with its share at 28 percent in total production and WSA of 0.79 million hectares. Marine fishery accounts for 15 percent of national production. The latter is likely to increase, since Bangladesh has negotiated a new maritime boundary with India, which provides an additional 11.9 million hectares of maritime water, with great potential for the expansion of marine fishing.

Inland aquaculture has transformed substantially since the 1990s, and the farmed-fish market has experienced a 25-fold increase in three decades, driven by demand from the domestic market (Rashid and Zhang 2019). Between 2004 and 2014, the amount of fishpond area and the number of fish farmers increased by 30.4 percent and 63 percent, respectively, while fish production increased by 117.4 percent in the same period. This impressive success in aquaculture has been driven mainly by the private sector. The number of wholesale markets, feed dealers, and fish traders has more than doubled, and capital intensity in the sector has increased substantially in the same period. Expansion of the rural road network, rising affordability, and access to new technology have been the crucial factors for sustained high growth in inland aquaculture. The domestic market has been the main trigger behind aquaculture transformation in Bangladesh; more than 90 percent of farmed fish (excluding shrimp) are sold on the domestic market.

Commercial shrimp production has been scaled up considerably as well, generating the country's third-highest export earnings, after the textile and leather sectors. Some species of shrimp and prawn with higher commercial values have been adopted. Growth-wise, the aquaculture fisheries subsector has performed particularly well among all subsectors (table 2.3). Between FY2005/06 and FY2017/18, annual production of inland aquaculture grew at 8.1 percent, due to

TABLE 2.3 Annual growth in fisheries area, output, and yield, FY2005/06 and FY2017/18

Percent

	AREA	PRODUCTION	PRODUCTIVITY
Capture	(0.25)	1.89	2.15
Culture	3.08	8.07	4.84
Marine	—	2.40	—

Source: Masykkanova 2020.

Note: FY = fiscal year; — = not available.

both productivity improvements and expansion of WSA. Production growth in inland capture fishing was moderate at 2.1 percent, while growth in WSA was negative. Despite this remarkable performance, the sustainability of inland capture and culture fisheries is at risk due to environmental and ecosystem degradation that has resulted from destructive fishing practices, overfishing of species with high commercial values, and poor resource management (UNCTAD 2017). Climate change poses additional risk to the sector's sustainability, especially for coastal aquaculture.

Spatial patterns of crop diversification

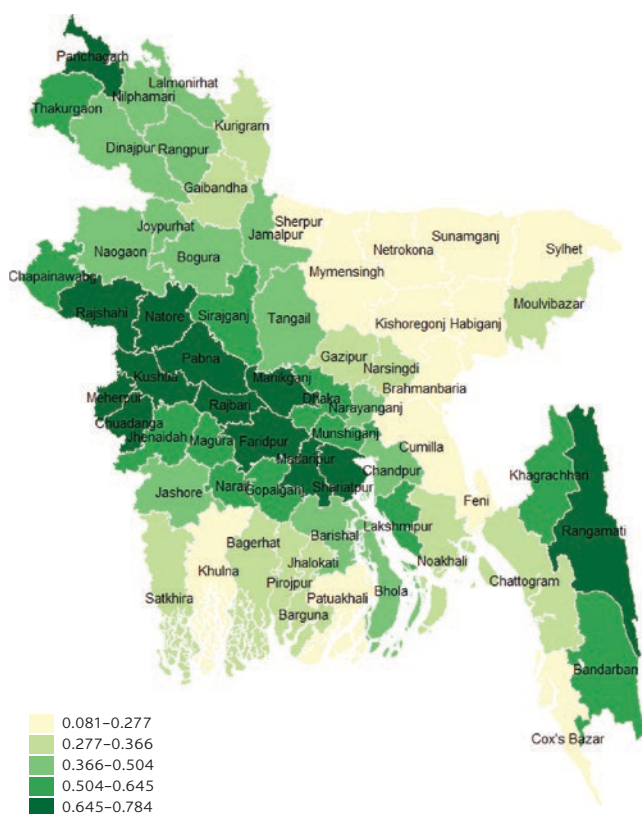
Overall, diversification in agriculture is gradually increasing across the country, with some regional disparities. Local agroecological conditions, availability of highland lands, access to irrigation, exposure to disasters, and proximity to markets all affect the level of diversity in the agricultural production system across the country. An area-based diversification measure known as Simpson's Diversity Index⁵ is high in some districts of the Dhaka, Khulna, Rajshahi, and Rangpur divisions, where urban proximity, large highland areas, and good irrigation coverage are critical elements for increasing cropping intensity (map 2.1). Farmers in the Dhaka division are also close to Dhaka, the capital city, which is the largest market in the country. While the Rangpur division has even more availability of highlands than Rajshahi, and similar (or less) exposure to droughts, it is less diverse compared to Rajshahi, primarily due to lower irrigation coverage (32 versus 90 percent). The degree of diversification is very low among districts in the Barisal, Mymensingh, and Sylhet divisions, with the largest share in lowland areas, where cropping intensity is also low. Districts in the *haor* (wetland) belt in the Mymensingh and Sylhet divisions, which grow mainly boro rice in the winter season and remain underwater for much of the other seasons, have shown much less diversification. The geospatial pattern of diversification highlights the importance of intensification for crop diversification. The share of area under rice also shows similar spatial patterns of diversification. (See table A.1 in appendix A.)

Panel *b* of map 2.1 presents changes in the crop diversification index across the country between 2014 and 2018. Despite this short span of time, there is a sign of positive change toward crop diversification across the country, except in select districts. Most districts have shown positive changes in the level of crop diversification, and a noticeable change is observed among the coastal districts of the Barisal and Khulna divisions. The increased diversification among districts in the coastal region is likely the outcome of rising salinity and climatic events such as the tropical cycles *sidr* and *aila*, which forced farmers

MAP 2.1

Simpson's Diversity Index by districts

a. Simpson's Diversity Index by district, 2018



b. Change in Simpson's Diversity Index between 2014 and 2018



Source: Hoque and Ahmed 2020.

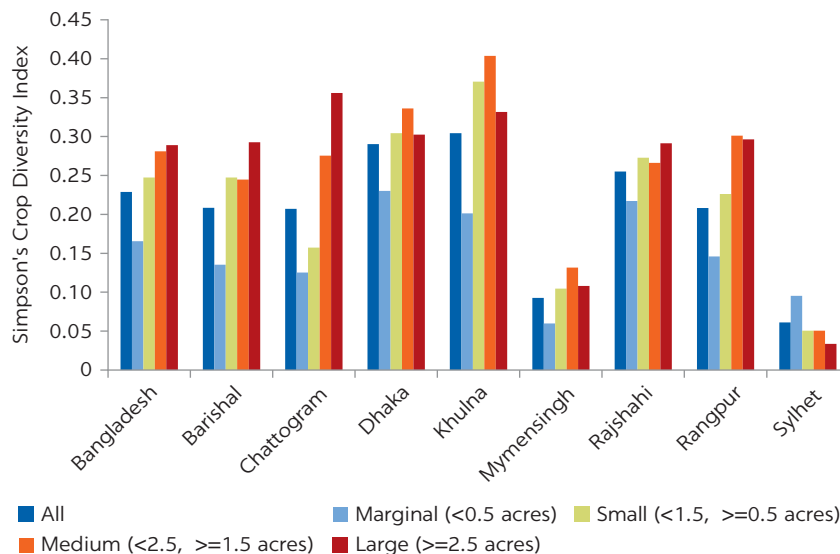
in the area to gradually diversify toward more saline-tolerant crop varieties and products for increased resilience.

Diversification at the household level, and price volatility

Regional diversity is also reflected in the data for household-level diversification. This study looked at diversification patterns using household survey data from the Household Income and Expenditure Survey 2016 of the Bangladesh Bureau of Statistics. This survey shows diversification at the household level and how the level of diversification is associated with farm size, access to markets, and use of inputs, among other factors. Not surprisingly, the level of diversification observed at the household level, which is also measured by Simpson's Diversity Index, is lower than what is observed in district-level data on land use for various crops. For instance, the average for Simpson's Diversity Index at the aggregate level was 0.46 in 2018, while it was just 0.23 at the household level in 2016. However, the spatial patterns of diversification are similar in both measures—households in the Dhaka, Khulna, and Rajshahi divisions demonstrate a higher level of diversification compared to households in other divisions (figure 2.13). As expected, diversity in production is higher among large-scale farmers, since they are more able to transition some of the land toward nonpaddy crops.

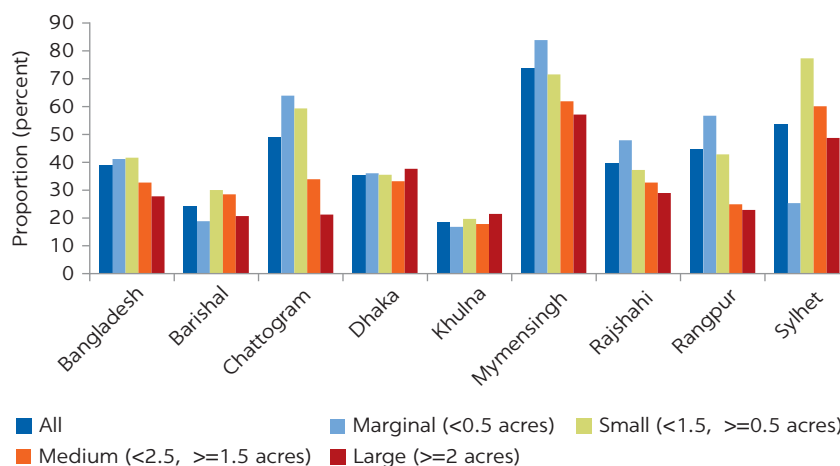
Households with larger farm sizes are more associated with diversified production behaviors. A similar diversification pattern is observed both spatially

FIGURE 2.13
Simpson's Diversity Index by household data



Source: Hoque and Ahmed 2020.

FIGURE 2.14
Proportion of farm households growing only rice by farm size

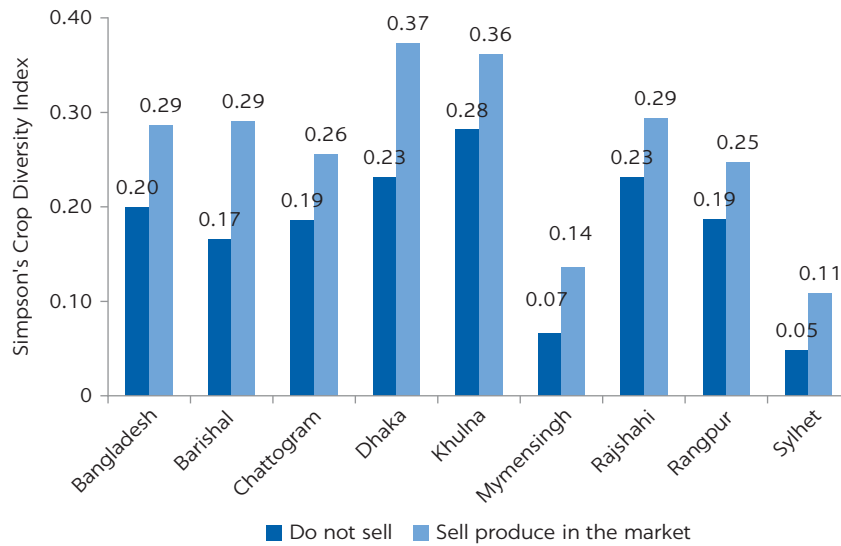


Source: Hoque and Ahmed 2020.

and by farm size when the proportion of farm households growing only rice is considered (figure 2.14). The proportion of farmers growing only rice is high among small and medium-size farm households compared to large farm households; this is understandable, since the share of subsistence farmers among smaller farm households is high.

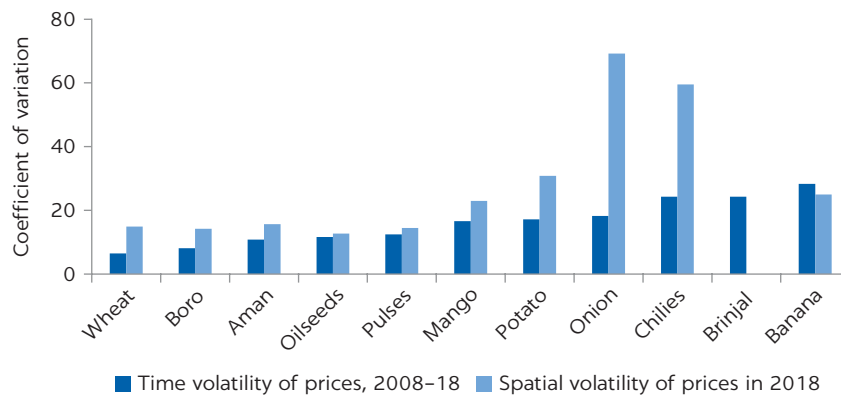
Access to markets is also key to agricultural diversification. Farm households with a greater level of market exposure (as measured by the markets they are able to access to sell their agricultural produce) are generally more diversified than farm households that did not sell their products in markets (figure 2.15). This pattern is more prominent in the Dhaka and Khulna divisions.

FIGURE 2.15

Crop diversification and access to markets

Source: Hoque and Ahmed 2020.

FIGURE 2.16

Volatility of prices for selected commodities

Source: Hoque and Ahmed 2020.

The regression results presented in appendix A also suggest that access to markets, along with transportation, agricultural machinery, hired labor, and agricultural credits, are significantly associated with the level of crop diversification in farm households.

Overall, the low level of diversification and the excessive concentration in rice production seem to be linked with the risk exposure of farm households to price variability.⁶ The production of rice and wheat carries much lower price risks than other high-value agricultural commodities, since the price volatility of cereals is much lower than that of noncereal agricultural commodities (figure 2.16). Both time-related and spatial price volatilities are higher for noncereal agricultural commodities. One key driver behind the more stable cereal prices is strong public policy support in the form of support for inputs and

procurement and research and development to ensure food security. However, such policy support toward growing cereals also creates a bias against the production of noncereal commodities, so farmers continue to grow cereals due to the low risk involved, despite lower gross margins compared to other agricultural commodities, as shown in the chapter 2 subsection “Diversification Potential at the Farm Level.”

POTENTIAL FOR AND SCOPE OF AGRICULTURAL DIVERSIFICATION

As has been demonstrated in the preceding subsections of chapter 2, the agricultural sector in Bangladesh has been rather static, with limited diversification into high-value products, despite the need to meet new demands imposed on the sector by shifts in consumer preferences. (The notable exception is in the fisheries subsector.) With a population in excess of 165 million people, and with rapidly growing household incomes and increased health consciousness among consumers, there is a rapidly expanding local market for fruits, vegetables, as well as protein-rich and processed foods (Dizon et al. 2019). These consumers also demand a higher level of food quality, safety, and hygiene; hence there is a need for modernization along the agrifood supply chains. The EAT-Lancet Commission report on food, planet, and health further stresses the need for radical transformation in the agrifood sector in order to deliver healthier and more sustainable diets at the global level (Willet et al. 2019). In contrast, Bangladesh’s current agriculture systems, aside from aquaculture, are predominantly at the subsistence level and have yet to rise to this challenge.

There are some structural advantages in the country that could be leveraged to boost diversification. First, the existing irrigation infrastructure can be reoriented to support other crop needs. More than 80 percent of the country’s agricultural land has access to water for irrigation on the edge of the fields (Gautam and Faruque 2016). This is especially useful during the dry season and for crops that are sensitive to water levels, such as fruits and vegetables. Evidence from household data also demonstrates that farms with access to irrigation are more diversified (Hoque and Ahmed 2020).

Second, an increasingly educated population provides the opportunity for entrepreneurial innovation, which is essential for the modernization of the agrifood sector. It also makes the introduction of new technologies, especially off the farm, easier and more sustainable. Indeed, Bangladesh has a very dynamic countryside, with many small businesses emerging.

However, productive diversification in agriculture will require a better understanding of market opportunities, natural resources, and agroclimatic conditions, as well as an enabling policy framework in order to mobilize farmers and private sector participants along the agrifood value chain.

Perceived market opportunities

Domestic market

With rapid urbanization and income growth, dietary patterns are changing in Bangladesh. Consumption patterns in Bangladesh have been changing quickly since 2000, partly due to increased purchasing power, and partly due to improved consumer awareness of the need for nutritious food. These patterns have

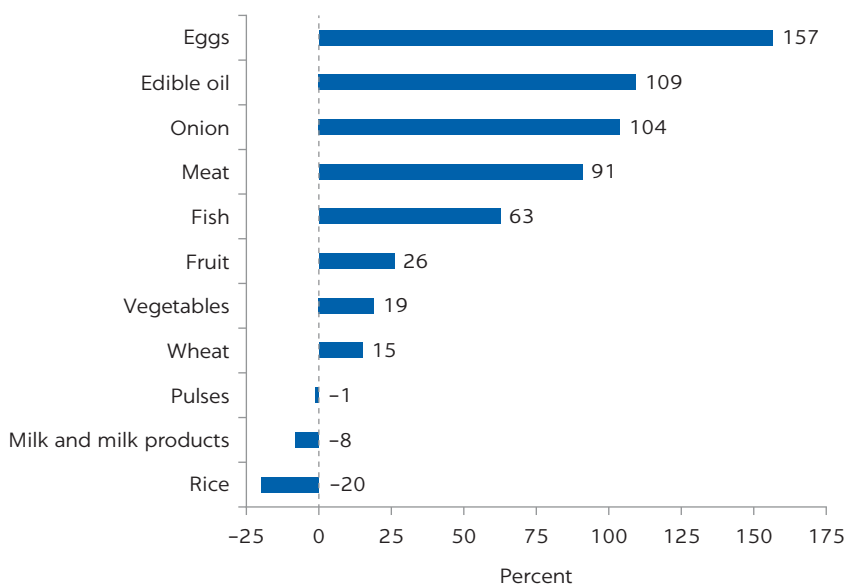
highlighted the need for transformation in the agrifood system in order to ensure a supply of more diverse, nutritious, and safer foods to the country's increasingly urbanized population (Dizon et al. 2019). Average cereal intake is declining rapidly, and the demand for nutrient-dense foods is growing. Since 2000, the average daily per-person rice intake has declined by 20 percent—from 459 grams in 2000 to 367 grams in 2016 (figure 2.17). The consumption of vegetables, fruits, fish, meat, onions, and eggs has increased considerably over the same period. Yet the present daily rice intake, which may be underestimated according to some studies, is still above recommended levels (Yunus et al. 2019). Also, the expenditure shares of the noncereal food groups (meat, milk, eggs, fish, oils, and so forth) have gone up noticeably since 2000. The share of cereals in total food spending has decreased, from 41.9 percent in 2000 to 29.2 percent in 2016 (Dizon et al. 2019).

It is expected that the daily rice intake will continue to decline, while the demand for high-value agricultural goods will rise in the coming years. A projection of increased demand for food commodities shows that total demand for eggs, fruits, meat, and fish will grow by more than 50 percent by 2030 compared to current levels (figure 2.18). At the same time, if the current declining trend of rice consumption continues, the total consumption of rice will decline by 9 percent by 2030.

While Bangladesh is meeting the current domestic demand for most food items locally, the country relies on imports for some key agricultural goods (figure 2.19). A few items are responsible for most of the country's agricultural imports, with 60 percent of imports composed of cooking oils, cereals, and sugars (figure 2.19 and figure 2.1).

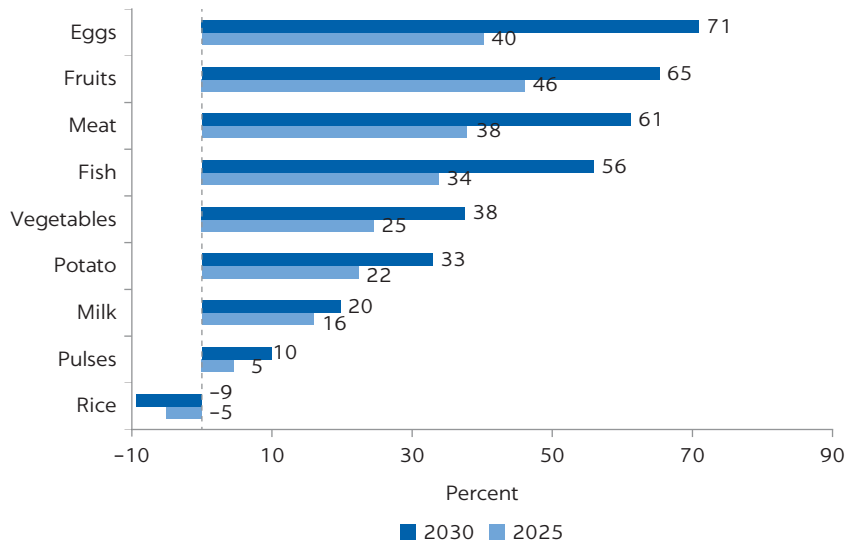
Bangladesh's trade deficit in food products has been widening, with a three-fold increase in imports, combined with a slight decrease in exports since 2007. In 2017, Bangladesh exported a total of US\$0.9 billion in food products and

FIGURE 2.17
Change in food intake, 2000–2016



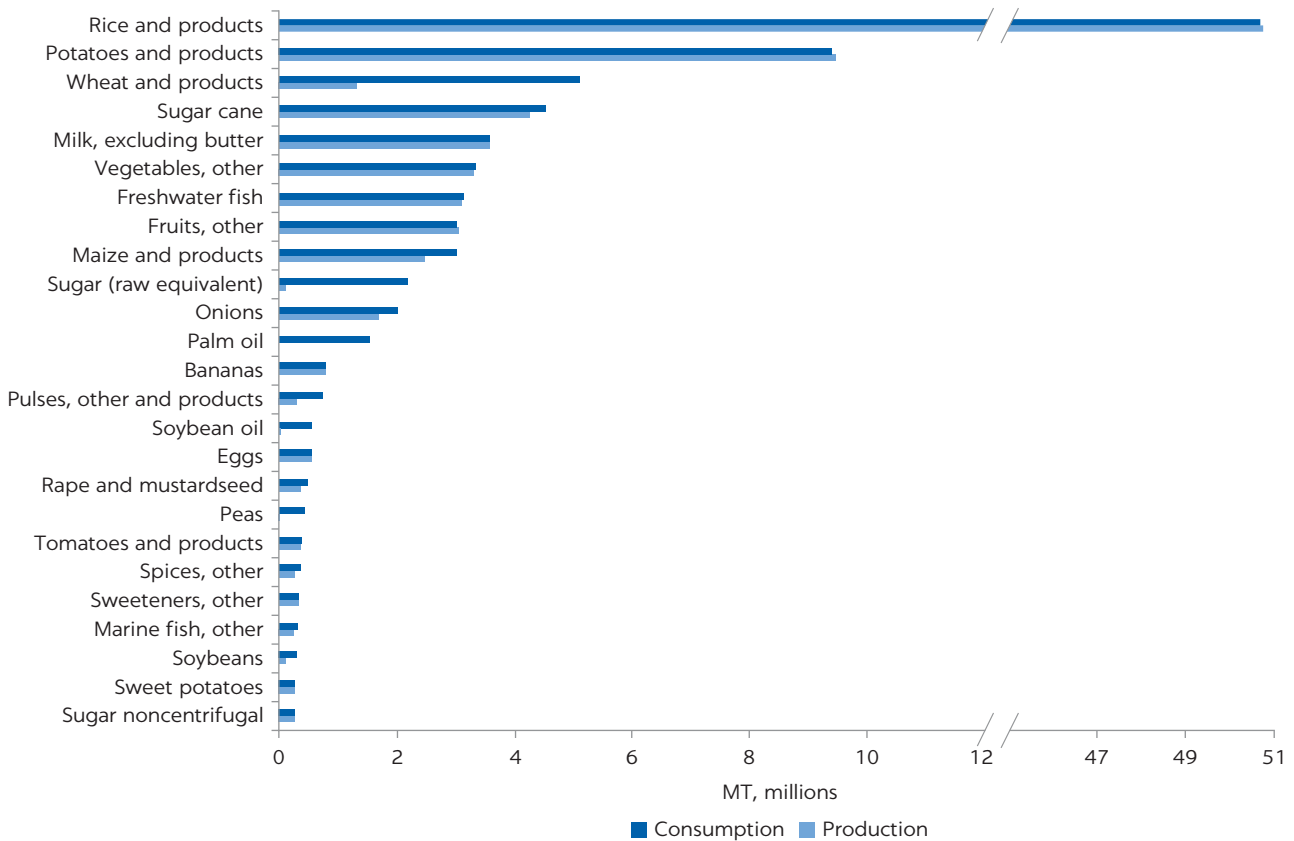
Sources: Based on BBS 2002, 2018.

FIGURE 2.18
Projected increase in total consumption, 2015–30



Sources: Based on BBS Household Income and Expenditure Surveys and United Nations Population Fund data.

FIGURE 2.19
Average food consumption and production, 2014–17

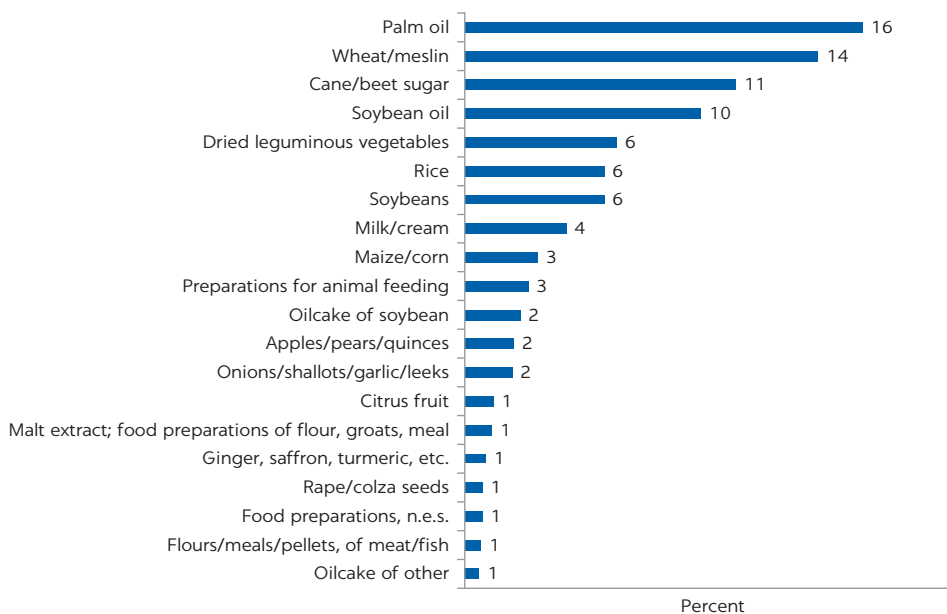


Source: FAO 2020.

Note: "Consumption" is assumed to be equivalent to "domestic supply quantity," as defined by FAO. MT = metric ton.

FIGURE 2.20

Top 20 products representing 90 percent of agrifood imports, 2015–18



Source: FAO 2020.

Note: n.e.s. = not elsewhere specified.

imported US\$10.7 billion, leading to a negative trade balance of US\$9.8 billion (figure 2.20). Since 2007, imports have tripled, while exports have decreased by 9 percent (figure 2.23). The overall decline in food exports was caused by fish exports dropping, from US\$631 to US\$496 million. All other food exports (excluding fish) grew, from US\$334 to US\$383 million, over the same period.

Export markets

Despite various policies intended to promote agricultural exports, they still account for a low share of the country's total exports. In 2018, more than 90 percent of Bangladesh's US\$40.5 billion in exports was in ready-made garments. By comparison, the amounts of the main agricultural-related exports were very small, as shown in figure 2.24).

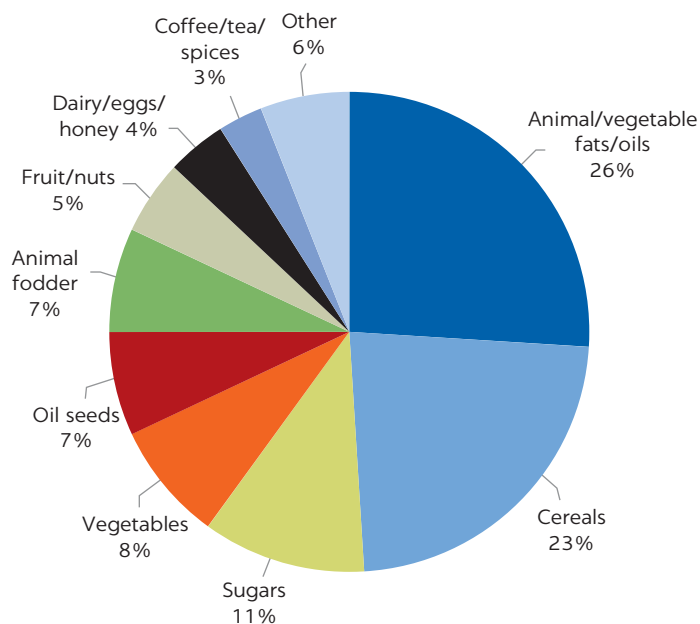
More than 50 percent of Bangladesh's food exports consist of live, frozen, or prepared fish and crustaceans (figure 2.25 and figure 2.26.).

Shrimp is the second-largest export product in the country; shrimp exports reached their peak in terms of volume at 96,500 MT in FY2011/12, gradually declining to 68,300 MT in FY2016/17, mainly due to poor compliance with international food safety and quality standards. The shrimp export industry has suffered from periodic bans and high incidences of alerts for Bangladeshi imports (UNCTAD 2017). Despite the government's efforts to promote better management practices and good agricultural practices,

FIGURE 2.21

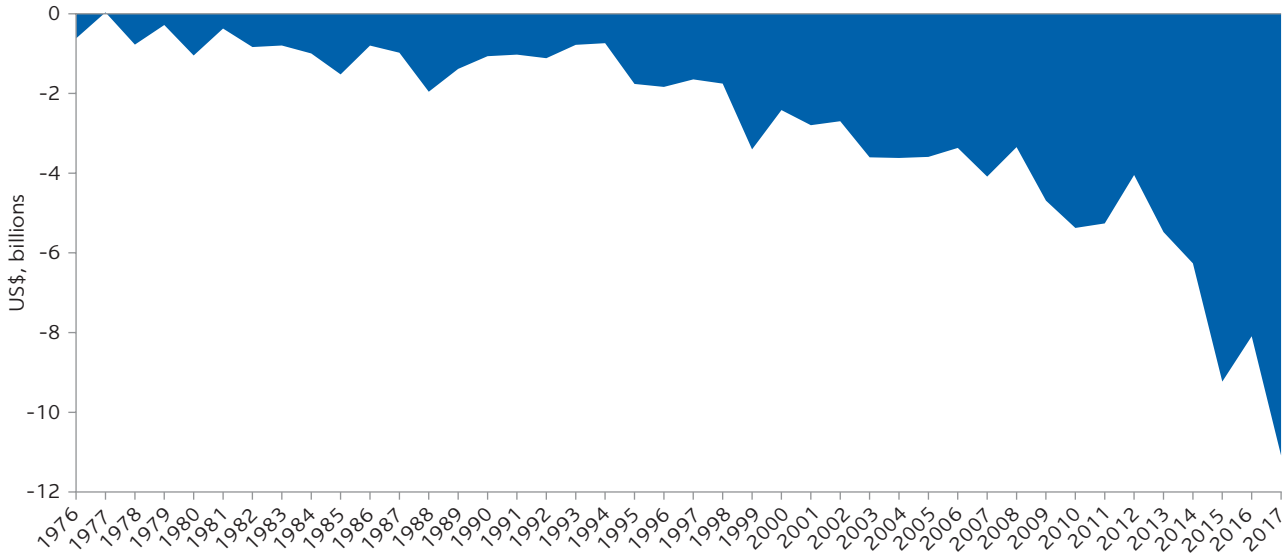
Percentage of import value by category

% total average import value of us\$7.2 billion, 2015–18



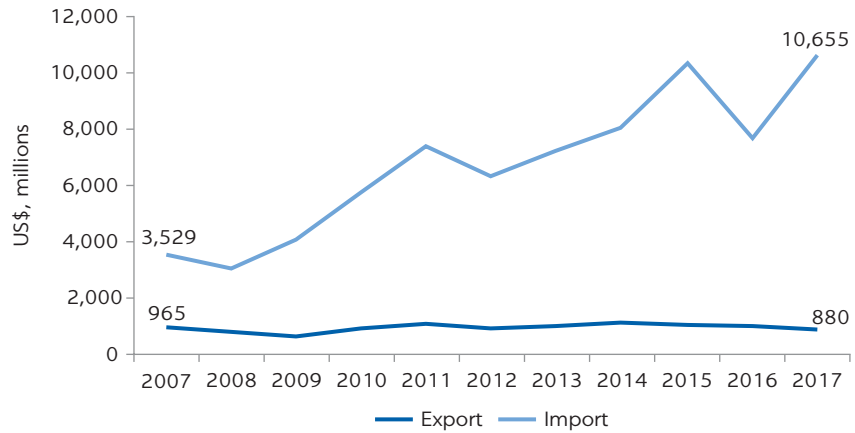
Source: FAO 2020.

FIGURE 2.22
Trade balance of agricultural products, 1966–2017



Source: FAO 2020.

FIGURE 2.23
Importation and exportation of agricultural goods, 2007–17

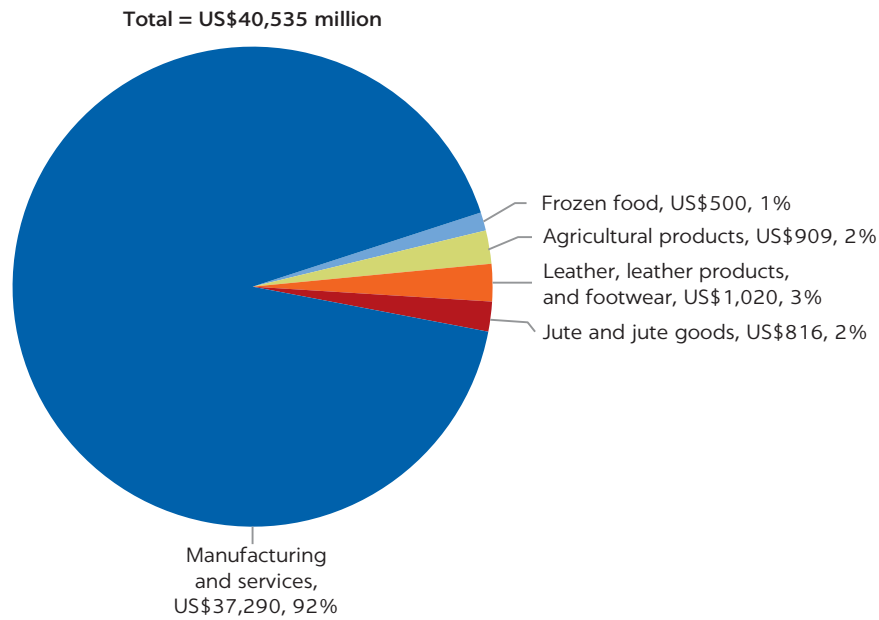


Source: FAO 2020.

and to raise awareness of international standards, hazard analysis and critical control points, and to enhance food safety infrastructure (FAO 2016), compliance monitoring and enforcement need improvement.

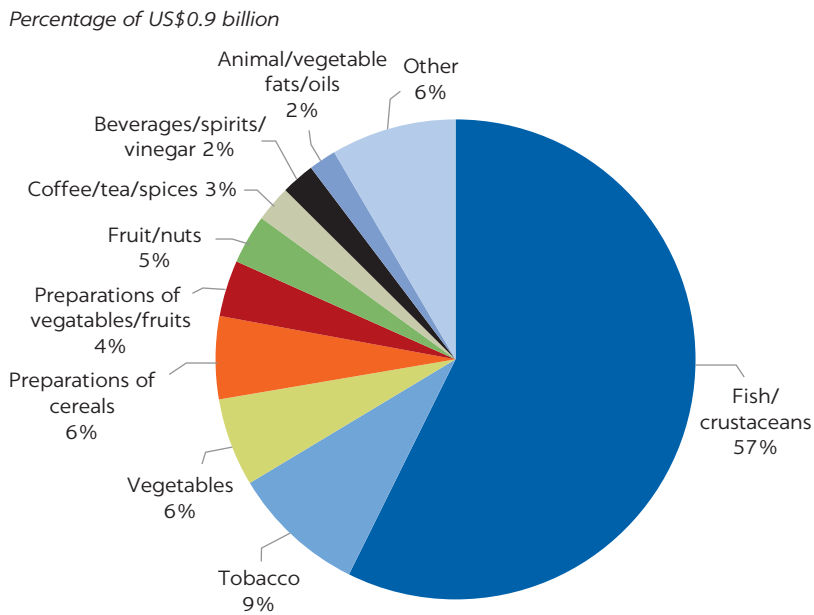
Exports of horticultural products have also suffered from a lack of compliance with international food safety and quality standards, as illustrated by the level of rejections from the European Union and the United States (World Bank 2014). In addition, government efforts toward addressing food safety and quality issues have been less pronounced for horticultural exports (Gautam and Faruqee 2016; UNCTAD 2017).

FIGURE 2.24
Share and value of exports, 2017-18



Source: EPB 2020.

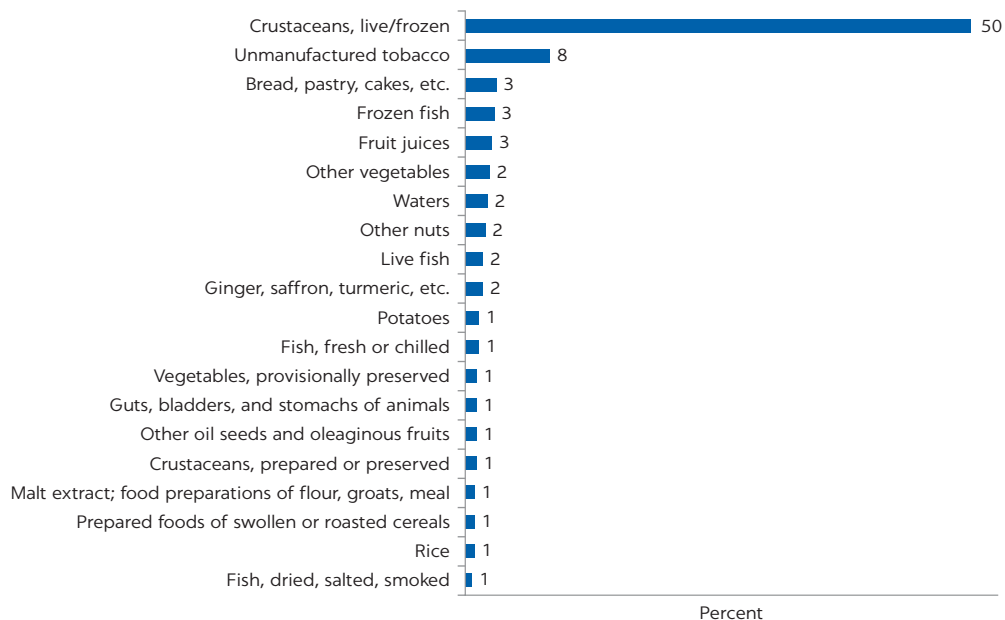
FIGURE 2.25
Percentage of export value by category of total average export value 2015-18



Source: FAO 2020.

Besides the challenges of meeting the safety and quality standards required by export markets, a key impediment to Bangladesh’s export potential is that its productivity is lagging behind that of its regional peers in most subsectors, thereby impacting its cost competitiveness. Since the late 1990s, yield growths have taken place across all key crops except areca nuts (figure 2.28). Animal

FIGURE 2.26
Top 20 products, representing 88 percent of agrifood exports, 2015–18



Source: FAO 2020.

products have, however, seen yield stagnation or declines, with the exception of eggs. Overall, Bangladesh underperforms in most animal items (table 2.4).² On average, Bangladeshi yields perform below regional and world averages, with the exception of paddy rice and mangoes, mangosteens, and guavas. As discussed in chapter 3, the lack of competitiveness in on-farm productivity is further compounded by constraints affecting the off-farm cost structure, such as high logistics and energy costs.

According to the International Trade Center methodology for assessing untapped export potential for a country's different sectors and subsectors, the main food and nonfood subsectors in Bangladesh with export potential are frozen shrimps and prawns, jute, and hides and skins (figure 2.27).

However, in the short run, diversification strategies appear to have greater potential by focusing on the growing domestic market. Improving on-farm productivity and off-farm cost competitiveness and building a strong compliance capacity for food safety and quality standards will be required in order to unlock the export potential, starting with regional markets.

Diversification potential at the farm level

Bangladeshi farmers rely on paddy production, even though they experience very low profit margins from it, compared to the assessed margins for other crops. In fact, farmers appear to have experienced losses in boro production in recent years, due to a persistent increase in agricultural wages in response to labor shortages in rural areas. A field survey estimated and compared the gross margins for crops including rice, maize, soybeans, gourds, potatoes, tomatoes, and mangoes. The survey took care to include field crops, legumes, and horticultural crops in order to provide a broad indication of how various options for diversification compare with rice (table 2.5). As with any analysis

FIGURE 2.27

Export of shrimp and fish, FY1999/2000–FY2016/17



Source: Masykanova 2020.

Note: FY = fiscal year; MT = metric ton. Dotted lines are linear trends.

TABLE 2.4 Comparison of national crop and livestock yields, annual average, 2014–18

	BANGLADESH	WORLD	AFGHANISTAN	BHUTAN	INDIA	NEPAL	PAKISTAN	SRI LANKA
Crops (MT per hectare)	Areca nuts	0.84	1.41	—	1.04	1.55	3.04	2.56
	Bananas	16.65	20.85	—	—	35.50	16.29	4.47
	Chilies, dry	1.31	2.29	—	5.48	2.14	4.78	2.23
	Mangoes, guavas	22.65	8.91	—	5.43	8.56	7.58	9.69
	Onions, dry	9.76	19.03	12.45	1.93	16.41	—	13.20
	Potatoes	19.96	20.67	14.73	10.07	22.28	14.11	21.83
	Rice, paddy	4.62	4.61	2.81	4.02	3.74	3.36	3.77
Wheat	3.09	3.40	2.09	1.91	3.10	2.55	2.83	
Livestock (kg per animal)	Eggs, hen	2.19	10.04	2.03	5.63	12.93	5.38	5.28
	Cow milk	205.32	2,449.12	494.38	1,386.66	1,587.90	612.44	1,230.00
	Goat milk	38.28	86.70	43.66	—	167.20	66.80	106.16
	Meat, cattle	71.20	219.36	180.00	103.00	103.00	85.00	195.94
	Meat, chicken	0.70	1.64	0.80	1.01	1.36	0.80	1.20
	Meat, duck	1.00	1.49	—	—	1.30	0.79	1.30
	Meat, goat	7.00	12.32	13.00	9.00	10.00	11.64	17.18

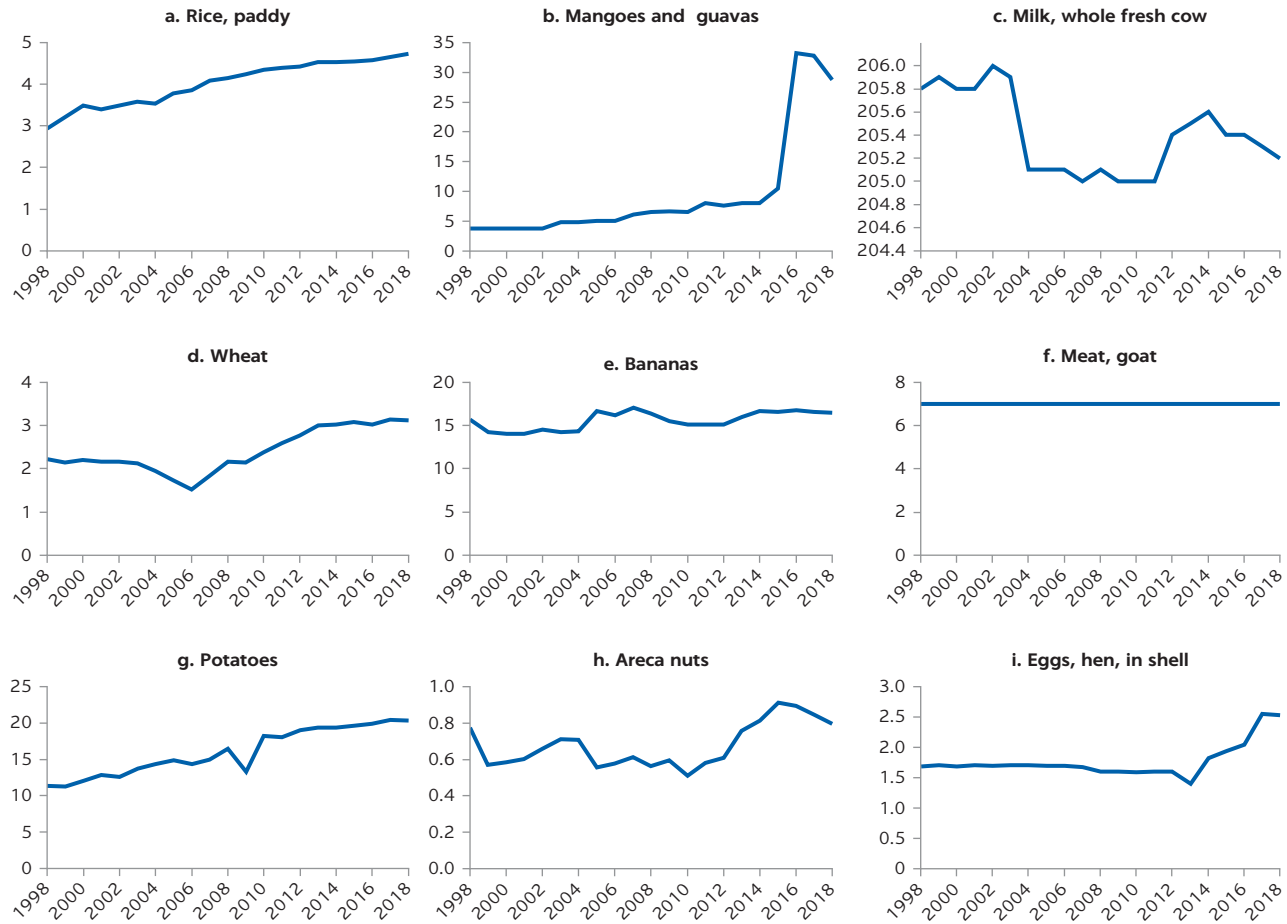
Source: FAO 2020.

Note: red = lowest, green = highest, and yellow = medium; kg = kilogram; MT = metric ton; — = not available.

of gross margins, costs and yields will vary considerably depending on the farmer's technical and managerial skills, as well as the geographic location of the farm. However, this analysis offers a broad sense of the opportunities for diversification and shows how the margins from alternative commodities compare with boro and other rice crops. It confirms that many crops offer farmers an opportunity for higher margins than rice does, and it can be assumed to be the reason why many farmers are gradually diversifying toward nonpaddy crops.

FIGURE 2.28

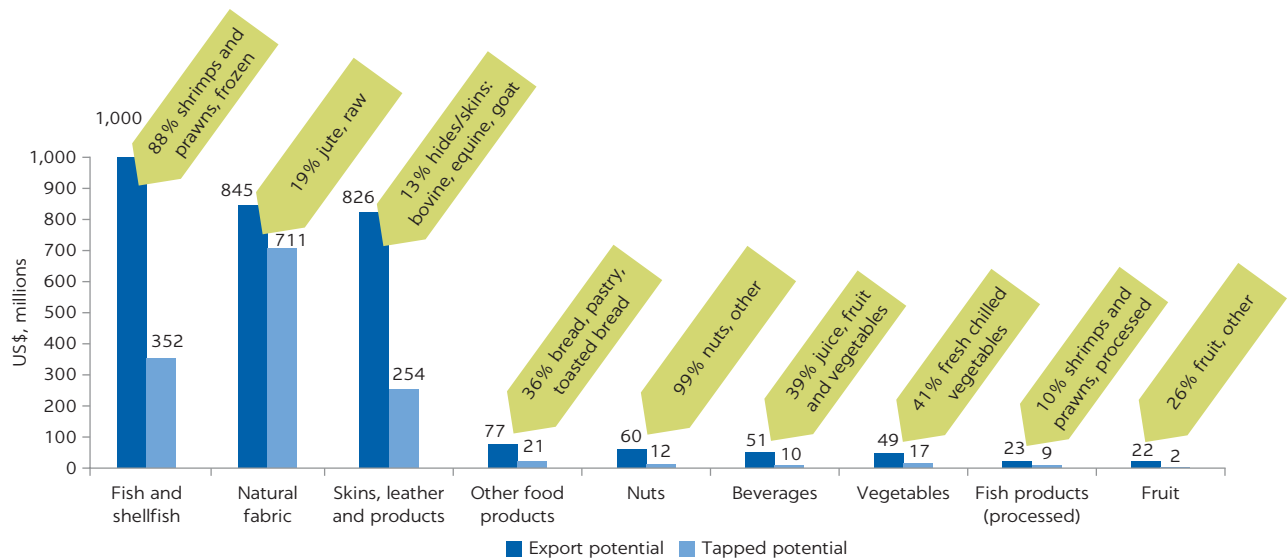
Yield evolution for selected products, in MT per hectare or kg per animal, 1998–2018



Source: FAO 2020.
Note: MT = metric ton, kg = kilogram.

FIGURE 2.29

Potential value of exports



Source: ITC 2020.

TABLE 2.5 Projected gross margins for rice and selected other crops in Bangladesh

US\$ per hectare

	RICE			LIVESTOCK FEED CROPS		VEGETABLES/FRUIT			
	BORO	AMAN	AUS	MAIZE	SOYBEAN	GOURD	TOMATO	POTATO	MANGO
Yield (kg/ha)	4,000	3,200	3,000	7,500	1,650	15,000	20,000	18,000	6,900
Price (US\$/kg)	0.16	0.21	0.21	0.18	0.47	0.14	0.08	0.09	0.38
Total revenue	659	678	635	1,324	776	2,118	1,647	1,694	2,598
Costs (US\$/ha)									
Seed	41	30	30	47	76	41	106	529	13
Fertilizer	89	59	53	186	29	98	219	72	132
Pesticide	47	35	40	18	18	62	71	141	176
Machine hire	96	82	71	71	59	71	71	71	0
Irrigation	118	0	0	44	18	59	82	40	88
Other costs	0	0	0	0	0	88	94	0	21
Labor, hired	282	282	259	471	282	741	565	529	494
Labor, family	56	75	56	75	56	329	75	127	264
Total costs	730	564	509	912	539	1,489	1,282	1,509	1,188
Gross margin	(71)	114	126	412	238	628	365	185	1,410

Source: Sergeant and Graffham 2020.

Note: ha = hectare, kg = kilogram.

Potential gross margins are clearly not the only driver for farmers' cropping choices. Issues of risk, including household food security, types of soils and climate, market access, level of investment, and technical skills also play a part in the decision-making. As this analysis clearly shows, the average margins associated with rice are slim, especially for boro rice, which the projections show as actually having negative margins. This finding is supported by Bangladesh Rice Research Institute data presented in a USDA Gain report (USDA 2019b), which shows that a farmer loses 1.2 Bangladeshi taka (Tk) per kilogram on boro rice (2017–18 data). This is further confirmed by a number of newspaper articles published in May 2019 that showed farmers burning their rice crops to protest the unprofitably low market prices. Despite these negative projections, the majority of farmers were still planting boro rice for the 2019–20 season, in the hope that prices would improve. After all, rice is a crop that they understand and know how to grow well; also, it is worth more to farmers for their own use than if sold on the open market, and it carries less risk. The alternative crops also require higher levels of management skills and technology.

Agroecology and diversification potential

While the potential for diversification through expansion is limited,⁸ it could also be achieved through intensification of production and crop substitution. With adequate investments and support, intensification could potentially be increased in almost all of the country's divisions except Rajshahi. However, this would require substantial investments in agricultural extension and research, irrigation and drainage, flood protection, soil management, and market access.

It should also be noted that declining groundwater availability is affecting pumping costs as well as availability of water for irrigation in the northwestern part of the country and in Dhaka.

Diversification through crop substitution can be achieved through closing the current yield gap. According to various studies, the gaps between the agronomic potential yield obtained in research fields and farm fields are considerable, ranging from 25 percent for boro to 75 percent for aus and aman paddy rice (Gautam and Faruque 2016; BARI 2016). A shift from boro paddy to other nonpaddy crops would address the problem of groundwater depletion as well as water pollution issues. The government has started to promote a shift from boro paddy to *kharif* paddy cultivations of shorter duration, and an increase in the production of pulses, which consume less water, and oil crops under its import substitution policy.

The potential for diversification in agriculture is considerable across all farming systems. Masykanova (2020) has highlighted the following options. In the rice-based farming system, *in lowlands* there is great potential for the expansion of vegetables, spices, and oil crops during the winter season, except in perennial wetlands, although in some wetlands, which are increasingly shrinking, possibilities exist for the expansion of nonpaddy crops. In areas of *higher elevation*, the cultivation of *kharif* and winter vegetables, spices, and potatoes could all be expanded. Sources of diversification in this system could include intensification, which is currently slightly below the national average; crop substitution; and possibly expansion, particularly in wetlands. The livestock subsector also appears to have potential for vertical diversification. Diversification potential also exists in shrimp farming. If adopted, it would strengthen the sustainability of both the industry and the ecosystem.

NOTES

1. The continuous increase in wheat importation was mainly driven by farmers switching from wheat production to rice production and the coverage expansion of various programs, which predominantly rely on wheat, under the public food distribution system.
2. For details on the decomposition method and data, please see Ahmed and Gautam (2020).
3. Districts of the newly formed Rangpur division were included in the Rajshahi division, which was the former division of these districts.
4. For detail on agricultural policy reforms and their impacts on agricultural growth, see Gautam and Faruque (2016).
5. The Simpson's Diversity Index is calculated as $SID = 1 - \sum_{i=1}^n P_i^2$, where P_i is the proportionate area (or production value for a value-based index) of the i^{th} crop in gross cropped area (total production value).
6. The price volatility of selected agricultural commodities is assessed both at the spatial level of administrative divisions and at the national level as a time series. The former exploits variation in monthly wholesale crop prices within a division, and thus gives a cross-sectional picture of the pattern of volatility. The latter measure is constructed by exploiting the variation in crop prices across geographical locations in a given month of the year, which would reveal how the prices of a specific commodity have changed over time. To calculate volatility, the measure of *coefficient of variation* is used.
7. Yields were unavailable for aquaculture.
8. One possibility could be to bring back current cultivable wastelands of around 232,800 ha (largely charlands), if technically possible.

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3 Agricultural Diversification and Modernization

CHALLENGES AND OPPORTUNITIES

INTRODUCTION

Many of the world's economies have achieved agricultural transformation. Others have delayed the process or have stagnated. Systematically and strategically addressing critical sector and cross-sector constraints determines the success or failure of a diversification strategy.

Bangladesh faces several agrifood ecosystem constraints, but also a number of opportunities, to varying degrees. This chapter presents the key elements of the ecosystem; focuses on the production factors, support services, and business climate; and analyzes the push and pull constraints to competitiveness and productivity, and hence agricultural diversification.

The agrifood sector in Bangladesh is characterized by a very strong focus on rice paddy production, low on-farm productivity levels compared to its regional and global peers,¹ and limited food exports. This chapter attempts to identify the main constraints that are preventing greater competitiveness of the agrifood sector—via greater on-farm productivity, greater value addition, and better connection of value-chain actors to markets—on both domestic and export markets. This will be done by analyzing the performance of the main components of the agrifood ecosystem: (1) the agrifood value chain, (2) support services, and (3) the business climate as it relates to the agrifood sector.

To identify and prioritize key policy and logistical bottlenecks in the main components of the agrifood system, this study organized a series of consultations with public and private actors along the value chain of each of the three subsectors covered in chapter 4: traders, large agriprocessors, other agrifood-related small and medium enterprises, service providers, business organizations, financial institutions, farmers, policy makers, research institutions, and development partners. In these consultations, separate sessions were organized on agricultural diversification, mechanization, agriprocessing, agricultural marketing and trade, and food safety and quality standards. Participants engaged in identifying and prioritizing the key binding constraints that are preventing the diversification of production and postharvest value addition. They also discussed and prioritized potential solutions for addressing the bottlenecks, to improve postharvest value addition.

Agribusinesses, along with other public and private participants, have identified some key bottlenecks along the agrifood value chain, including limited access to finance, weak food quality and safety standards, poor marketing and logistical infrastructures (such as cool chains and cold storage), costly logistical services, the lack of good agricultural practices (GAPs) among farmers, and the lack of high-quality, modern seed varieties, among others. Participants in the consultations also highlighted some potential solutions for addressing these bottlenecks. This chapter discusses these issues and presents the findings from relevant data analyses, as well as a review of existing literature and government policies.

PERFORMANCE OF THE AGRIFOOD VALUE CHAIN

The agrifood value chain (figure 3.1) is characterized by uneven performance in its several nodes and by the need to improve market links among these nodes.

Research and development

The country has a strong agricultural research and extension base, particularly for paddy rice, which has brought the country into the status of near self-sufficiency in rice. As noted in the Agriculture Science and Technology Indicators (ASTI) database, Bangladesh's agriculture research expenditure is about 0.35 percent of gross domestic product (GDP), which is above the spending shares of Cambodia, India, Pakistan, and Vietnam, but below the shares of China, Malaysia, and Sri Lanka (FAO 2020).² However, the share of agricultural researchers engaged in horticultural research is one of the lowest in the region. While past focus of research and development (R&D) on food security has served the country well and produced good results in rice yields, there is a need to broaden the focus toward nonrice and noncrop agriculture, since substantial yield gaps exist in almost all nonpaddy crops.

The government, through research institutes and universities, plays a vital role in determining the focus of the research agenda and in setting research priorities for the sector. Greater coordination between private and public sector agencies would help to better inform the choice of these priorities. This is already being done to some extent via organizations such as the Krishi Gobeshona Foundation, which provides a platform for coordination and information sharing on climate change.

The enabling environment could also be made more conducive to private sector research. Certification of technology takes around two years, and the weak business environment for seed development is reflected in a poor *enabling the business of agriculture* score on supplying seed (World Bank 2019a). Bangladesh scored 18.5 out of 100, while the average for South Asia is above 50.

FIGURE 3.1
The agrifood value chain



Source: World Bank.

Certain regulatory barriers remain and are preventing the acceleration of private sector participation in R&D to develop nonrice crop varieties and agricultural technologies that are tailor-made for conditions in Bangladesh.³

Another challenge is the ability to transfer the outcomes of agricultural research to farmers. Agriculture in Bangladesh is dominated by smallholder farmers, with some 60 million people operating 12 million farms of less than 0.69 hectare (ha) and approximately 5 million people living on farms with areas ranging from 0.69 ha to 3.0 ha (Rapsomanikis 2015). In 2019 the official literacy rate for rural areas was 67 percent. However, the literacy rates for male farmers ranged between 25 percent and 30 percent, and the rate of illiteracy was higher for female farmers, especially for growers older than 60 years of age, for whom the literacy rate could be as low as 1 percent. In the medium term, improvements to education in rural areas will be an essential feature of any program to modernize agriculture and make it more sophisticated and efficient.

In the shorter term, improvements to extension are required in order to get information on new techniques down to farm level in a usable form. Part of the challenge here is literacy. The other challenge is how best to get information out to around 15 million farms scattered across the country. The current Department of Agricultural Extension (DAE) system is lacking the resources to meet this challenge, and current extension techniques and materials need improvement. Improved support for DAE staff is required, most notably with regard to updating agricultural knowledge and techniques for training. More support is needed for private-sector-led training programs such as those of PRAN Foods (a leading agriprocessor in the country), and there is also a need for closer integration between DAE and the private sector to maximize the efficient use of available resources, including support for the private operators who routinely provide extension advice to farmers, like input suppliers, but who also need to be trained themselves.

Some innovations have already taken place along the agrifood value chain. For example, rapid uptake of the use of plastic crates instead of woven baskets and jute sacks to handle high-value products like mangoes reduces postharvest losses. PRAN provides advice and extension services to growers on GAPs, including on quality and safety requirements. The company has also introduced a traceability system by labeling all crates with the growers' names; this provides a way of tracing products back to a group of 15–25 growers via a unique reference code in the event of a quality or food safety problem. Innovations in service delivery have also been observed in some cases. For example, the custom hiring services of agricultural machinery have helped to rapidly expand agricultural mechanization in the country.

Land

Around 85 percent of farm households operate with less than 1 ha, implying the farm sizes are highly fragmented in Bangladesh.⁴ The country has around 7.9 million ha of net cultivated area, including wetlands and excluding cultivable wastelands (table 3.1). The gross cultivated area (GCA) is approximately 15.5 million ha. The national average cropping intensity is 195 percent, but it ranges from 152 percent in hilly areas in the east to 220 percent in the north-west highlands.

TABLE 3.1 Agricultural land by division and by utilization, FY2017/18

DIVISIONS	NET CULTIVATED AREA (NCA) (HA)	GROSS CULTIVATED AREA (GCA) (HA)	IRRIGATED AREA (HA)	SHARE OF IRRIGATED AREA IN GCA (%)	CROPPING INTENSITY (%)	SHARE OF DIVISION IN NCA (%)	SHARE OF DIVISION IN TOTAL IRRIGATED AREA (%)
Chittagong	1,045,344	1,957,895	189,474	10	187	13	2
Sylhet	650,202	988,259	730,364	74	152	8	10
Dhaka	1,210,931	2,233,603	1,118,623	50	184	15	15
Mymensingh	720,243	1,428,745	1,357,895	95	198	9	18
Barisal	759,109	1,254,251	724,291	58	165	10	10
Khulna	1,063,968	2,178,138	1,713,360	79	205	13	22
Rajshahi	1,327,126	2,858,704	1,402,429	49	215	17	18
Rangpur	1,178,543	2,588,664	382,996	15	220	15	5
National	7,955,466	15,488,259	7,619,433	49	195	100	100

Source: Masylikanova 2020.

Note: ha = hectare.

As one of the largest deltas in the world, Bangladesh has highly fertile soil, and a climate with multiple cropping opportunities for both tropical and temperate crops (BPC 2018; Nasim et al. 2017). Diversity in physiography, soil quality, climate, and land level in relation to flooding is very high, forming 30 agroclimatic zones. Around 71 percent of the nation's cultivable lands are located in highland and medium highland areas, and the remaining 29 percent is located in several different lowland categories (BBS 2017). However, more than 80 percent of the land area in Bangladesh is a floodplain, crisscrossed by more than 450 rivers. As a result, agricultural lands are prone to flooding, droughts, cyclones, and tidal surges annually. Thus, the level and duration of anticipated flooding along with the elevation of farmland in relation to flooding guide farmers' choices for cropping patterns.⁵

Some smallholder farmers may have the opportunity to expand production by renting land from the few large landowners who may have scattered parcels around several villages. However, leasing agreements are normally for only one to three years. Such limited tenure discourages long-term investments in new production technologies and can even discourage farmers from practicing proper crop rotations.

Water

Abundant rainfall during the monsoon season, combined with full-flowing rivers, typically leads to extensive inundation of the floodplain, a situation exacerbated by impeded drainage. Around 22 percent of the country is inundated annually during normal flooding, to depths ranging from 0.3 to 2.0 meters, and severe floods affect up to 80 percent of the country. This creates both opportunities and risks: opportunities for crop and aquaculture production but also considerable risks from deep flooding and the related erosion and drainage problems. In stark contrast, in the postmonsoon period, surface water availability is significantly constrained and this, combined with the erratic premonsoon rainfall, can cause serious soil moisture deficits, which must be addressed through irrigation. Under these conditions, flood control and drainage are critical to agricultural production in both the monsoon and postmonsoon

seasons, while irrigation is vital to addressing water deficits in the pre- and postmonsoon seasons, as well as during the monsoon season in the drought-prone highlands.

More than 95 percent of the country's 7.6 million ha of irrigated lands is irrigated with tube wells and power pumps (table 3.2).⁶ However, the irrigation coverage is very low in the hilly and highland divisions. Groundwater accounts for 75 percent of irrigation, while the remaining 25 percent comes from surface water pumped from canals and rivers using small low-lift pumps (FAO 2013).

Groundwater storage is declining rapidly due to the expansion of boro rice. One study estimated a 32 percent decline in the amount of groundwater storage between 2003 and 2013 (Khaki et al. 2018), and several districts in the northwestern part of the country and in Dhaka city reached critical points for groundwater depletion (Khaki et al. 2018; BPC 2018). To address this issue, the government started promoting a shift in its import substitution policy, from boro paddy to biannual kharif paddy cultivations of shorter duration, as well as increased production of pulses, which consume less water, and oil crops.

Diversification toward nonpaddy crops, especially high-value vegetables and fruits, requires better flood, water, and drainage control by farmers. Between June and September, when about 90 percent of the country's rainfall takes place, farmers need drainage. In low-lying areas, the production of nonpaddy crops is difficult even with good drainage. In higher elevation areas, there is a need for improved flood protection structures. And in the nonmonsoon seasons, farmers need a reliable and sufficient supply of water through irrigation. Technically, the existing small-scale pump irrigation can support the required water control. But declining groundwater availability is affecting pumping costs as well as the availability of water for irrigation in the northwest and in Dhaka. A shift from boro paddy to other nonpaddy crops would address both groundwater depletion and water pollution issues.

Labor

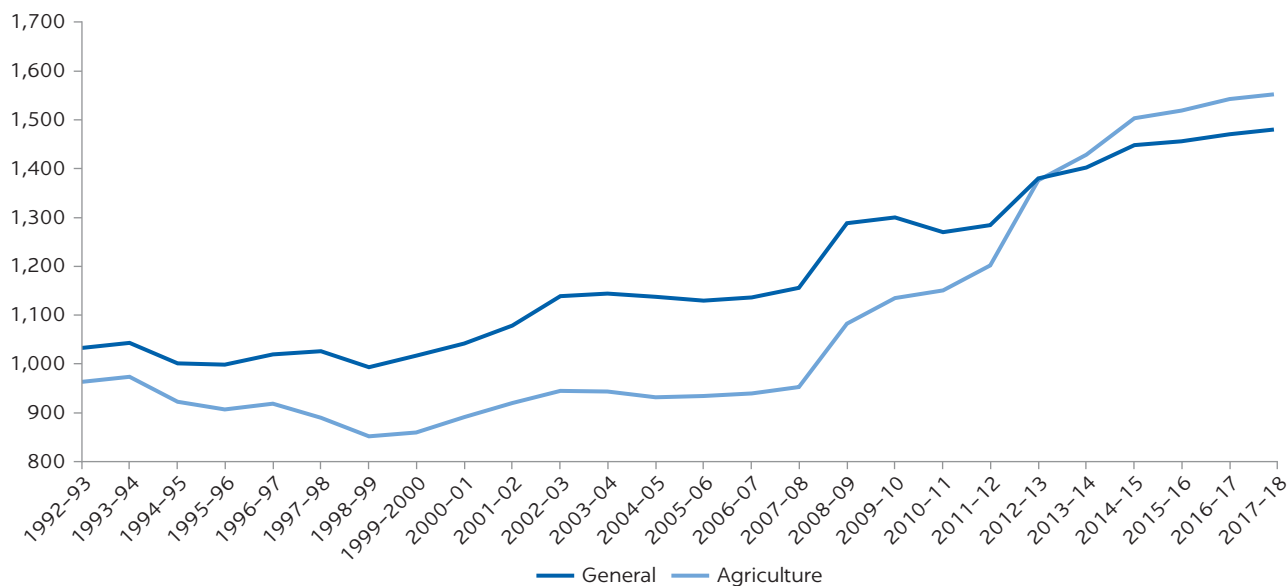
Crop diversification and the use of agricultural labor are strongly linked (Hoque and Ahmed 2020). While agriculture accounts for most rural employment in Bangladesh, seasonal agricultural labor shortages are growing. Due to high migration from rural areas to both domestic cities and abroad, the rural labor

TABLE 3.2 Irrigation coverage, FY2016/17

	AREA (HA)
Power pumps	1,256,275
Tube wells	6,046,964
Shallow tube well	4,759,919
Deep tube well	1,270,445
Hand tube well	16,599
Canals	—
Traditional sources	316,194
Total irrigated areas	7,619,433

Source: Masykhanova 2020.

Note: ha = hectare; — = not available.

FIGURE 3.2**Real wage index, base = 100, FY1969/70**

Source: MOF 2019.

market is being continuously squeezed; thus, agricultural wages are rising faster than the general wage rate (figure 3.2). Moreover, women are increasingly engaging in agricultural activities. The number of women engaged in agriculture increased by 45 percent between 2006 and 2016: from 7.7 million in 2005/06 to 11.2 million in 2015/16 (figure 3.3). Also, the share of women workers in total agricultural employment has increased from 34.0 percent in 2005/06 to 44.1 percent in 2015/16. This trend is often identified as the “feminization of agriculture.”

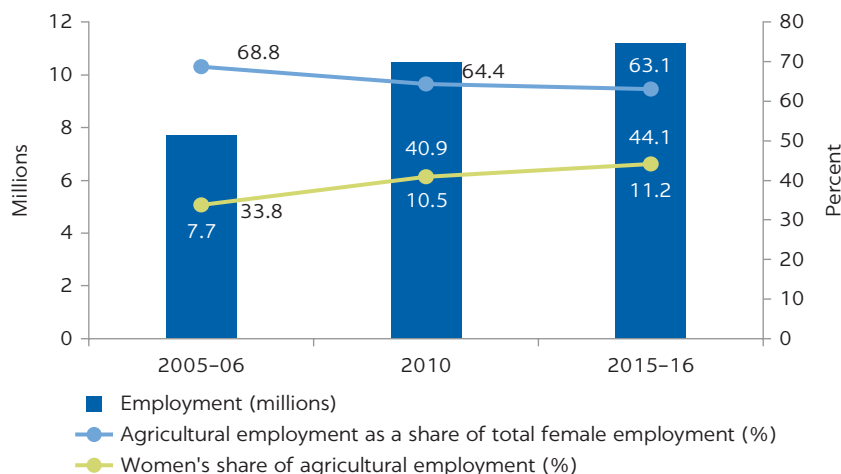
This transition in the agricultural workforce comes with its own challenges as women face more constraints than men accessing markets, finance, technology, and services. The transition implies the need for tailored support for women along with agricultural diversification and modernization in order to achieve better productivity as well as income opportunities for women in agriculture.

Agricultural mechanization

Bangladesh is one of the most highly mechanized agricultural economies in South Asia (FAO 2013). Current mechanization rates for major operations are comparable with highly mechanized countries in East Asia (figure 3.4). Indeed, agricultural mechanization helped large-scale farmers in closing the productivity gap with small farmers, and the inverse farm size–productivity relationship has diminished over time (Gautam and Ahmed 2019). The country’s success with rapid and scalable mechanization was achieved through policies that enabled the private sector to lead development of the service market. The main policy actions were the elimination of import duties on most machines, shifting preferences from expensive high-quality machinery to more affordable machinery of “good enough” quality, and the provision of subsidies to support private players in manufacturing and mechanization service providers (CIMMYT 2012; FAO 2013; Kennedy 2018).

FIGURE 3.3

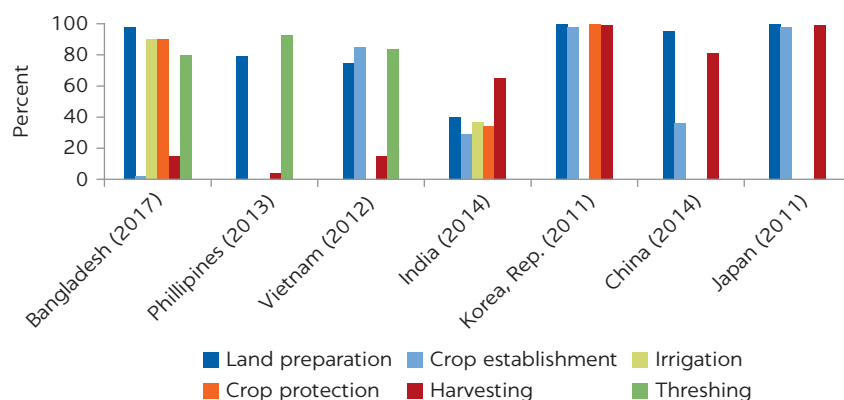
Share of female agricultural workers



Source: BBS various years, labor force surveys.

FIGURE 3.4

Farm mechanization rates in selected countries



Source: Masyilkanova 2020.

Today, more than 80 percent of the country's land preparation and primary tillage operations are mechanized through the use of two-wheel tractors (table 3.3). About 60 percent of the country's agricultural land is irrigated with more than a million small diesel-powered pump sets (FAO 2013). Spraying, broadcasting, and threshing operations are also widespread. Gaps do exist, however, in the mechanization of seed establishment, crop protection, irrigation (particularly high-efficiency irrigation technologies), and harvesting operations. Most of these operations can easily be mechanized with attachments to existing tractors (FAO 2019), but the mechanization of harvesting through combine harvesters is expensive. Its cost is justified in large-scale grain farming, however, where economies of scale can be achieved.

While it is technically and financially cost-effective, the mechanization of crop establishment and harvesting with the use of attachments has not scaled up in Bangladesh for multiple reasons. Government policy on the matter has

TABLE 3.3 Status of farm mechanization

Percent

FARM OPERATIONS	KABIR W. [2017]	NATH ET AL. [2017]
Land preparation	80	98
Crop establishment		
Transplanting/seeding	1	2
Broadcasting	1	—
Crop care		
Sprayer	95	95
Broadcaster	95	—
Water pump	85	>90
Weeding	5	5
Harvesting		
Cutting	1	3
Threshing	75	80
Cleaning	5	18
Combine harvesting	<1	15
Drying	<1	0

Source: Masyllkanova 2020.

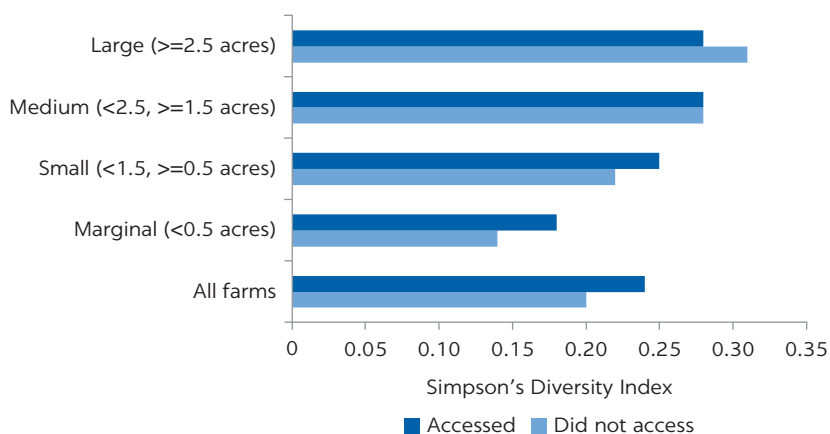
Note: — = not available.

two objectives: to increase farm mechanization and to support the local manufacturing sector. To achieve the first objective, the policy facilitates mechanization through the provision of subsidies and loans, elimination of trade barriers, and tax exemptions for machinery. To achieve the second objective, it imposes trade barriers for the importation of spare parts (for example, through import taxes of 40–50 percent). This policy has been successful in supporting the local manufacturing of tools such as threshers, sprayers, and broadcasters, which can be made locally due to their simpler designs and the availability of required materials locally and at affordable costs (FAO 2019).

However, local manufacturers have lacked the skills, knowledge, and technology to design and produce more sophisticated seeders and reaper attachments with the required accuracy and at affordable costs (CIMMYT 2012). Moreover, past policies and programs were primarily “technical,” with a limited focus on raising farmers’ awareness of agricultural machinery, developing their operational and maintenance skills and knowledge, and marketing. Operation of seeders, for instance, is knowledge intensive and requires extensive training; however, farmers and service providers were provided with only short-term, on-the-job training. Similarly, repair and maintenance skills were not adequately covered.

Complete mechanization of farming operations would facilitate diversification by increasing cropping intensity as well as increasing paddy productivity, which is critical for releasing paddy lands (FAO 2019). In the boro season, for instance, direct planters, which do not require the removal of paddy straws, would reduce planting time by almost 15 days. In the kharif season, multipurpose seeders and reapers would decrease the time needed for land preparation, seeding, and harvesting, thus allowing the production of two kharif crops of shorter duration and additional crops in the boro seasons. The evidence also suggests that access to agricultural machinery helps marginal and smallholder farmers diversify (figure 3.5).

FIGURE 3.5

Access to agricultural machinery and Simpson's Diversity Index

Source: Hoque and Ahmed 2020.

There is also scope for the expansion of mechanization for crop establishment, harvesting, and postharvest operations in horticultural crops; for example, the planting and harvesting of potatoes is currently largely manual. Mechanization of postharvest operations for most horticultural crops is similarly limited.

Fertilizers and pesticides

Farmers have very good access to fertilizers at affordable prices, and more than 95 percent of Bangladeshi farmers use them. However, unbalanced use and overuse of fertilizers is widespread due to a lack of incentive for efficient uses, a lack of knowledge, and the reliance on traders' recommendations for fertilizer dosages (Gautam and Faruquee 2016). Integrated pest management is rarely practiced at present and excessive use of fertilizer is common in all crops and fruits (PRAN 2019). For example, PRAN outsources the production of mung beans, tomatoes, mangoes, cassava, chili, bananas, and pineapple through contract farming arrangements. In its contracts, the company introduces GAPs and integrated pest management practices. While the rejection rate of produce has reduced considerably since adoption of GAPs, it is still around 10 percent and is primarily due to the excessive use of chemicals, followed by poor postharvest management practices and adulteration with poor-quality crops (PRAN 2019).

Overall, fertilizer use has increased steadily over the past three decades. From 2003 to 2016, fertilizer consumption jumped from 160 to 289 kilograms (kg) per ha of arable land. This compares with a South Asia average of 160 kg in 2016 (166 kg for India and 144 kg for Pakistan) (World Bank 2020). Significant subsidies for fertilizer use explain these high consumption rates. The strong focus of past policies on nitrogenous fertilizers has led to an imbalance in the use of nitrogen relative to other nutrients. The evidence suggests that almost half of all farmers are overusing fertilizer, with apparently no additional output being realized. In addition, the overuse of fertilizer could have negative environmental, health, and even farm productivity consequences through the degradation of resources (Gautam and Faruquee 2016).

In recent years, subsidies have been increased for potassium and phosphorous macronutrients in order to address concerns about resource degradation resulting from an overuse of nitrogen.

Seeds

There is a substantial shortage in the supply of quality seeds. The total demand for seeds for all crops is 932,250 metric tons, but the formal seeds sector manages to supply only 20 percent of these. The remaining share is covered by the farmers' own seeds (88 percent) and seeds smuggled in from India (12 percent) (BPC 2018; USAID 2014; BRAC 2019; LTS 2019). Supply gaps for formal seeds vary from crop to crop: for example, the current supply of potato seeds is 60 metric tons, against an estimated demand of 300,000 metric tons (BRAC 2019). For most crops, the seed deficits are caused not by limited production capacity, but rather by dissemination constraints. In the potato seed supply chain, for example, the current basic infrastructure (roads and electricity) and the logistics system do not allow for timely dissemination of seeds (box 3.1). Contrarily, the horticulture seed supply is controlled in response to actual demand, mainly due to farmers' limited access to finance and insurance products, extension services, and markets (LTS 2019).

At present, both the public and private sectors are active in the seed industry. The public seed sector's focus is on notified crops,⁷ while the private sector covers more than 90 percent of hybrid seeds for two notified crops (paddy rice and maize), improved and hybrid varieties of vegetables (54 percent), and pulses and legumes (USAID 2014). As of 2013, there were about 200 seed companies, with 17,000 registered seed vendors, and 50,000 mobile seed vendors, representing a market value of more than US\$125 million. Most of these companies enjoy good access to international seed technologies through partnerships with major international seed and seed export-import companies. However, only two companies—BRAC (Bangladesh Rural Advancement Committee) and Lal Teer

BOX 3.1

Potato seed supply

The private sector plays an important role in the potato seed value chain, from research and breeding to distribution and extension. Currently, the national demand for potato seeds is around 300,000 metric tons (MTs), but only 60 MTs of seeds are being supplied. Private seed companies have sufficient production capacity to meet the demand. However, seed storage and dissemination are constrained by an inadequate supply of electricity, ineffective logistical services, and a weak transportation infrastructure. BRAC (Bangladesh Rural Advancement Committee), which is the lead potato seed company in the

country, rents 20 out of the total 72 cold storage units in the country in order to spread the risk of storage losses due to electricity blackouts. Moreover, potato seeds require preheating and fanning prior to their release from storage. Under Bangladesh's climate conditions, the timeframe between the release and seeding is 72 hours. However, existing road conditions and lack of refrigerated trucks make maintaining this timeframe difficult. According to BRAC, under current conditions, serving remote districts in the southern and eastern parts of the country is impossible.

Source: BRAC 2019.

Seed—have complete value chains, from research and breeding to extension. Private companies have formed the Bangladesh Seed Association, through which they collaborate with the government on developing and improving seed policy and regulations.

Current regulations are largely favorable for the private sector's participation in the seed industry. These permit the marketing of seeds for nonnotified crops and require basic compliance with the Bangladeshi quality standards and phytosanitary requirements for imported seeds (USAID 2014). At the same time, the private seed sector is prohibited from breeding and producing seeds for notified crops except paddy rice (Gautam and Faruqee 2016; USAID 2014). Another issue is the lack of a quality control mechanism for seeds. At present, seed quality is expected to be maintained through market competition. However, the seed market is also supplied with low-quality seeds at lower prices, which increases farmers' mistrust toward certified seeds (BRAC 2019; LTS 2019).

Measures that could contribute to improving access to and use of quality seeds include the following: removing the regulation that prevents private sector actors from breeding and producing seeds for notified crops, increasing public-private coordination on developing and supplying quality seeds for notified crops, and increasing market transparency regarding the quality and effectiveness of seeds in the market.

Production and postproduction

Overall, except for paddy rice and a few other products, the production node of the value chain in Bangladesh is faced with low yields, although it enjoys good connections with the market via a thriving network of traders.⁸

Many factors contribute to these productivity challenges. Analysis of the R&D and input supply nodes of the chain shows that farmers either tend to have limited access to certain key inputs (for example, seeds and labor) or are using them improperly, for example by overusing fertilizer. Extension services are also inadequate for supporting widespread adoption of GAPs.

The limited size of farms prevents realizing cost efficiencies from economies of scale. Farm incomes are very low (an average of US\$2.90 per day), making investment in modernization and innovation difficult.² Informal as well as formal aggregation mechanisms, such as cooperatives, play a limited role in Bangladesh, which—when compared with other countries—creates additional challenges of reach for extension services, the pooling of resources for access to finance and infrastructure, and the aggregation of products for marketing, with the resulting higher logistics costs and disconnection from end buyers.

The field mission did, however, observe some instances of farmers working together to create economies of scale:

- Farmers growing maize in neighboring villages gained advantages by sharing their experiences and creating a critical mass of market-informed farmers to enable the emergence of a competitive market to buy their output.
- In Rangpur, a number of farmers on adjoining fields established nurseries to raise vegetable seedlings; this critical mass attracted buyers from all over the country. Interestingly, there appears to be little cooperation and exchange of ideas among the farmers involved, but it may have created the competitive environment in which to improve each other's offerings.
- PRAN has organized large numbers of farmers to supply them with specific raw materials for their processing.

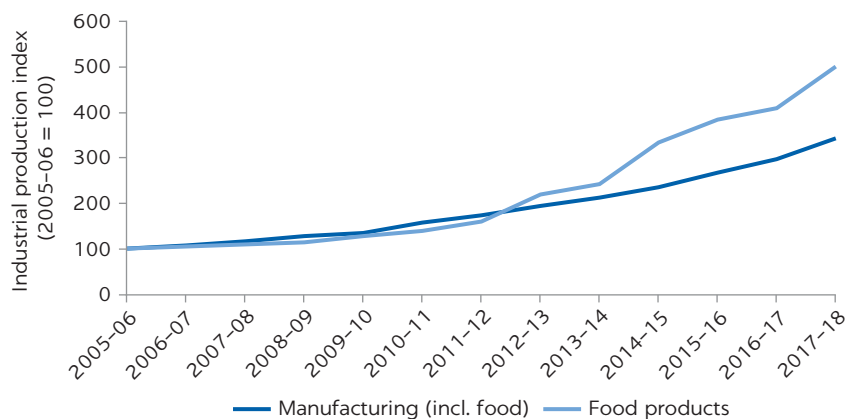
As will be explained in the analysis of the distribution and marketing node of the value chain, despite these challenges, farmers are well connected to markets thanks to a very active network of traders who are competing to source products, and are therefore offering farmers competitive prices (Gautam and Faruque 2016). However, the scarcity of well-established off-takers—processors, formal distributors,¹⁰ and exporters—limits knowledge transfers and the use of higher quality standards in the market with the better on-farm agricultural practices that tend to follow and the premiums farmers can receive for higher-quality products.

Processing and value addition

While the food-processing industry is still in its infancy in Bangladesh, it is starting to expand to meet local demand. Typical of a country that is in agricultural transition, adding value to agricultural products will become increasingly important. Currently, most food processing is targeted at the local market, with some exports to neighboring countries and a diaspora of Bangladeshis to the Middle East. The production of processed food has started to grow in recent years and has increased more quickly than the index of general industrial production (figure 3.6). However, the number of processors remains limited and does not provide formal off-taking opportunities for farmers as seen when analyzing the production node of the agrifood value chain. This contributes to the limited focus on higher product standards along the value chain.

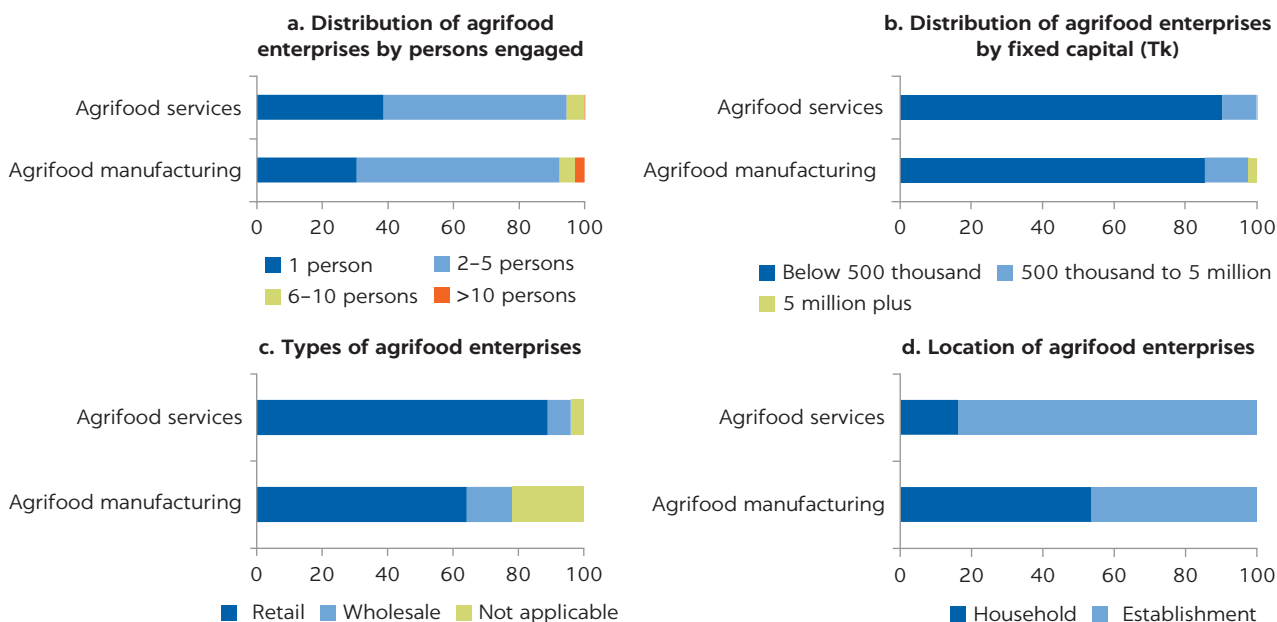
Indeed, the agrifood business sector in Bangladesh is dominated by small and microbusinesses. The majority of agrifood enterprises engage two to five persons, and about one-third of these enterprises create jobs for only one person. Only about 13,000 out of half a million agrifood manufacturing enterprises create jobs for more than 10 persons. Manufacturing enterprises among agrifood businesses are larger in size (in terms of both employment and fixed capital) and generate more jobs as compared to service enterprises in the agrifood sector (figure 3.7). More than 85 percent of the enterprises in the agrifood sector have fixed capital of less than Tk 500,000 (about US\$6,000); most of them are retail businesses, and over half of the agrifood manufacturing enterprises are household based.

FIGURE 3.6
Index of industrial production



Source: MOF (Ministry of Finance) 2019.

FIGURE 3.7

Distribution of agrifood enterprises in 2013

Source: BBS 2013.

Distribution and marketing

A main feature of the distribution and marketing node of the value chain is its informality, with almost 98 percent of the flow of agricultural goods transiting via rural wholesale markets, larger wholesale markets around large cities, and wet markets and corner shops in cities, with the associated challenges of inadequate infrastructure and lack of quality and food safety standards enforcement. Other major challenges, especially for the marketing of perishable products, are improper transportation conditions and lack of reliable access to energy, both of which are described in greater detail in the following section.

Visits to major wholesale markets in Dhaka and Rangpur, and rural wholesale markets in villages in North Bengal, have highlighted the fact that general transactions in domestic wet markets were reasonably efficient, with many players involved and obvious and relevant roles for each player. The major weaknesses in the wholesale markets were related to physical infrastructure and facilities. Drainage, flooring, and weatherproofing within the markets were poor, and access to roads is inadequate, leading to serious problems for market access and flooding during the monsoon season. Supplies of clean water for the washing and freshening of produce were limited or nonexistent. Such practices increase food safety risks from microbiological and chemical contaminants. There is considerable scope for improvement in the basic infrastructure of the markets; such improvements would have benefits not only in terms of improved consumer health, but also in better-quality produce and reductions in losses during distribution and marketing nodes.

As countries move through the transition phase toward urbanization, supermarket retailers take on a bigger role in the consolidating and retailing of fresh produce and other food products. Major retailers have the resources not only to improve conditions at the point of sale but also to drive

improvements upstream, encouraging suppliers to invest in better production, harvesting, and postharvest handling techniques. Supermarket retailers are also more likely to invest in refrigerated transport and temperature-controlled warehouses and distribution centers.

In Bangladesh, retail supermarkets are in their infancy, accounting for only around 1.0 percent of retail sales of fruits and vegetables. Shwapno, the biggest player with 37 stores, has a 48.0 percent share of the market for fresh fruits and vegetables that are sold through supermarkets, but this equates to just 0.8 percent of the total market, with traditional wet markets still accounting for 98.4 percent of sales. In 2018, Shwapno's revenues from fresh fruits and vegetables were US\$117 million and profits US\$18.5 million per annum (Shwapno 2019). Shwapno is beginning to develop closer relationships with its growers and trying to encourage the adoption of GAPs as well as better management practices, but the size of the business is still too small to support major investments within the supply chain.

Other developing countries have also taken a long time to develop modern retail chains, but over time supermarkets in such countries have invested in standards and management systems to improve quality and food safety at the primary production level, and have encouraged and supported farmers in forming farmer organizations to invest in better production, handling, and transport technologies.

Ultimately, urbanization tends to result in increased consumer demand for more convenient ways to obtain safer food, which in turn leads to a shift from wet markets to more formal retail options like supermarkets. Consumer sensitization campaigns regarding the risks related to the consumption of unsafe food can contribute to accelerating this shift.

PERFORMANCE AND KEY CHALLENGES FOR SUPPORT SERVICES

Access to finance

Despite Bangladesh's favorable history in microfinance penetration and financial inclusiveness, farmers' access to finance is still constrained by a number of factors, including the lack of sufficient funds to support the agricultural sector; limitations in existing eligibility criteria, which require land ownership or guarantees from the landlord to use land as collateral; the high level of risk in agriculture, and consequently high interest rates; and poor diversity in the availability of financial products and services that are suitable for small-scale farmers (Anderson, Leach, and Gardner 2016; BKB 2019). Access to finance is also limited in aquaculture; almost half of the country's fish farmers, particularly small and marginal farmers, have poor access to finance (Katalyst 2016).

In 2018, the Bangladesh Bank disbursed through state and commercial banks, as well as microfinancing institutions, Tk 214 billion (about US\$2.5 billion) for agricultural lending (table 3.4). According to the Bangladesh Krishi Bank's (BKB's) estimates, actual demand for agricultural financing exceeds current supply by two to three times. Of the total agriculture portfolio, almost 85 percent was in short-term loans, and 50 percent was for the crop subsector.

TABLE 3.4 Agricultural lending, FY2016–FY18*Tk, billions*

	FY16	FY17	FY18
Crops loan, excluding tea	86.95	100.61	103.37
Irrigation equipment	2.60	3.01	2.74
Livestock	26.14	30.57	30.58
Marketing of agricultural goods	1.09	1.14	1.14
Fisheries	19.85	24.13	24.64
Poverty alleviation	15.59	18.85	21.50
Other agricultural activities	24.24	31.68	29.96
Total	176.46	209.99	213.93

Source: Masykhanova 2020.

Existing financial products are limited to basic seasonal and short-term loans. Financial and technological packages such as crop and weather insurance products were piloted, but with limited scaling up. Demand for such products exists, especially from the private sector, as for example, from contract farming arrangements; crop insurance programs are currently being promoted by companies such as PRAN (PRAN 2019). Farmers, of which 77 percent report being affected by weather-related risks, and 53 percent by pests and disease, recognize the importance of risk management products (Anderson, Leach, and Gardner 2016). But adoption of such products will depend on the right mix of instruments. A study by Ward et al. (2015), which examined farmers' preferences for weather index insurance and drought-tolerant rice varieties, found that farmers are generally unwilling to adopt the drought-tolerant insurance, largely under nondrought conditions. According to the report *Enabling the Business of Agriculture 2019*, there is a law regulating the operation of warehouse receipts in Bangladesh that offers the possibility of issuing negotiable warehouse receipts (World Bank 2019a). However, this instrument, which allows for the financing of agricultural goods in storage, does not appear to be in practical use in the market.

Nonfarm actors along the agrifood value chain also experience challenges in access to finance. According to the 2013 Economic Census Survey, about 99 percent of all nonfarm enterprises fall into the micro, small, and medium enterprise (MSME) categories. Bangladeshi MSMEs have limited access to formal financing when compared to the average for the South Asia region; according to International Finance Corporation's (IFC) calculations, the estimated financing gap amounts to about US\$2.8 billion (World Bank 2019b). Yet in 2013, MSMEs provided employment to 20.3 million workers in Bangladesh.

Storage

The country's existing storage infrastructure is mainly government owned. Agricultural storage units are designed for storing dry food grains and horticultural products. Government-owned cold storage facilities are dedicated primarily to storing potato seeds (BRAC 2019). There are few privately owned and managed cold storage facilities not dedicated to potato and potato seeds. Capacity of the existing storage infrastructure is inadequate (BRAC 2019; LTS 2019). Farm-level warehouses are also limited, which causes most farmers to sell their

products immediately after harvest. According to a 2018 survey by Bangladesh Bureau of Statistics (BBS), for most crops the availability of storage infrastructure is more important for increasing farm incomes than market location. Farm-gate prices for almost all reported crops that are not sold immediately after harvest are higher: in the range of 14 percent for lentils and 32 percent for potatoes. Price fluctuations, largely resulting from inadequate access to market information and storage infrastructure, are a key factor in the low adoption of diversification practices (Miah and Haque 2013).

Private sector operators have established a cold chain infrastructure in certain subsectors. For example, the privately owned Bengal Meat company has invested in a cold chain to transport its products.¹¹ This company delivers 2 percent of the meat sold in Dhaka. The private sector has also invested in cold storage for potatoes. Bangladesh has over 390 privately owned cold stores, and they store about 4 million tons of potatoes each year. These storage facilities have low losses, and they make it possible to have an adequate supply of potatoes in the off-season.

Dried goods can be stored much more easily, but they still benefit from proper storage structures. Part of the livestock milling industry has put up silos to store locally produced maize. These larger stores allow for proper management and care of the goods in storage, with only good-quality dry grain entering storage to prevent losses due to rodents and the development of aflatoxins. As maize production increases, there will need to be more storage facilities, so that maize can be kept longer.

Access to power

According to the 2019 Competitiveness Index of the World Economic Forum, Bangladesh ranked 108th in terms of electricity access among 141 countries and 68th in terms of the quality of the electricity supply (WEF 2019). According to the World Bank's Ease of Doing Business, Bangladesh ranks 176th out of 190 countries for the "Getting Electricity" indicator, with an overall score of 45, and a score of 0 out of 8 in reliability of supply and transparency of the tariff index.¹² The South Asia average is 2.7.

Since 2009, the country has tripled its capacity for installed power generation (Zhang 2019). However, as of 2016, 24 percent of the population still did not have access to electricity. The rate of access was actually higher in rural areas, at 31 percent. Less than 80 percent of the existing power-generation capacity is operational, with frequent scheduled blackouts. On average, electrical outages can occur 80 times per month, and last from 5 hours for firms to 10 hours for households. This is particularly challenging for manufacturing operations, including food processing.

The price of electricity for agriculture is subsidized, primarily at the expense of industrial and individual users: the current electricity rate for farmers is 25 percent lower than the actual cost and is lower than the cost for both individual users and businesses (US\$0.03 per kilowatt for farmers compared to US\$0.04 for individual consumers and US\$0.08 for businesses). Gas-based power is also subsidized for fertilizer producers. The use of solar power in agriculture is limited.

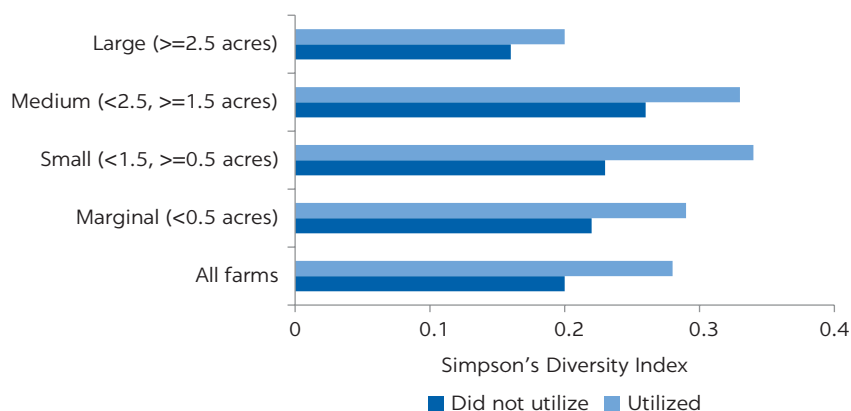
Transport and logistics

In agriculture, a well-developed transport infrastructure allows for a more efficient flow of market signals, reduces production and marketing costs and losses, and improves the quality and marketability of products. As evidenced by the aftermath of the Jamuna Bridge construction, improved connectivity facilitates the adoption of technology, diversification toward high-value crops (both perishable and nonperishable), and intensification in farming (Blankespoor et al. 2018). Basic infrastructure is also key for the development of efficient logistics services, which are in turn essential for the production of high-value agriculture (Herrera Dappe et al. 2019). Evidence suggests that access to and use of transportation for carrying produce is strongly associated with the level of diversification. It should be noted that access to transportation supports small and medium-size farms more than large ones (figure 3.8).

In Bangladesh, the basic infrastructure is underdeveloped, and poorly maintained and managed. According to the 2019 Competitiveness Index of the World Economic Forum (WEF 2019), among 141 countries, Bangladesh ranked 117 in terms of road connectivity, and 108th in terms of the quality of road infrastructure. The transport infrastructure (roads, inland waterways, and railways) has limited intermodal connections and networks and is concentrated near two big cities: Greater Dhaka and Chittagong City. Poorly managed and maintained roads are the main mode of freight transport, followed by inland water transport (table 3.5). Despite an abundance of rivers, inland water transport remains underdeveloped, and railways are handling insignificant freight volumes. In addition to limited capacity, the existing infrastructure is outdated, and intermodal facilities among the three modes of transportation do not exist. As a result, the country faces heavy congestion, slow movement of goods, and unreliable logistical systems, which translates into high transportation and logistical costs.

In agriculture, which is the second largest sector in freight generation, the shares of such costs are highest for perishable horticulture, at 48 percent of total revenue (Herrera Dappe et al. 2019). Of the total cost, storage costs count for 30 percent and direct logistics for 70 percent, of which more than half is transportation costs, and the remaining amount for indirect costs such as

FIGURE 3.8
Crop diversification and utilization of transport for carrying produce



Source: Hoque and Ahmed 2020.

TABLE 3.5 Transport mode use for agricultural freight

Percent

DIVISION	ROAD			WATERWAYS	RAIL
	PUCCA (PAVED)	SEMI-PUCCA	KATCHA (UNPAVED)		
Barisal	98.57	56.63	54.72	8.63	—
Chittagong	98.23	57.46	51.44	2.63	0.11
Dhaka	98.70	49.31	40.46	2.90	0.26
Khulna	98.87	46.21	31.57	1.42	—
Mymensingh	98.48	46.57	56.51	1.90	0.07
Rajshahi	98.74	42.09	42.59	3.92	0.13
Rangpur	98.69	35.72	47.07	0.85	0.09
Sylhet	98.51	48.91	54.30	3.27	0.10
Total	98.60	47.55	45.71	2.83	0.11

Source: BBS 2019.

Note: — = not available.

formal and informal fees. The most widely used vehicle for transporting agricultural produce between major towns is a seven-ton truck, which has an average cost of US\$0.095 per ton per kilometer. To put these costs into perspective, comparable transport costs in India and Pakistan are US\$0.025 and US\$0.022 per ton per kilometer, respectively. The dwell time for containers at Chittagong port (4 days for exports and 11 days for imports) adds significantly to the logistical costs in Bangladesh for exporting and importing agricultural produce. According to the Ease of Doing Business, Bangladesh ranks 176th out of 190 countries for the Trading across Borders indicator, with an overall score of 31.8, and cost scores to import and export are significantly above those of the South Asia average.

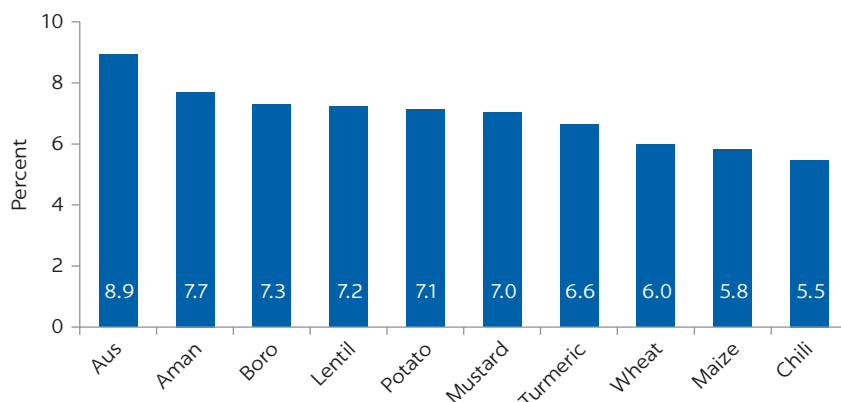
The national logistics system is currently hampered by having 9 ministries and more than 20 government agencies that play active roles in setting policies and regulations, as well as in planning, operating infrastructure, and providing services. Despite, or because of, all of these regulatory bodies, the oversight of the road transport sector is poor. Trucks are overloaded, and they cause damage to roads and bridges, they frequently crash,¹³ and regulations regarding the qualifications of drivers are poorly enforced, resulting in the fact that unqualified drivers can operate big trucks by simply paying a “facilitation fee” to obtain a license (Herrera Dappe et al. 2019).

Packaging

The 2018 Agriculture and Rural Survey conducted by BBS (2019) shows that the country’s production and postharvest losses appear to be reasonable—around 7 percent (figure 3.9). Gautam and Faruqee (2016) also demonstrated, with a survey of stakeholders for selected value chains, that physical postharvest losses are very low (less than 5 percent).

In recent years, the introduction of better packaging has certainly helped to reduce losses and maintain product quality: for example, the use of plastic crates for perishable fruit. Investment in these crates was made by private sector actors because they recognized its benefits.

FIGURE 3.9
Production and postharvest loss



Source: BBS 2019.

However, the use of packaging and labeling remains limited, given the informal nature of most of the country's distribution and marketing of food products.

Standards, testing, and certification

At the present time, the development and implementation of standards for primary production is in its infancy in Bangladesh. The majority of farmers have no concept of GAPs and keep no records at all. The government and some private-sector food processing and supermarket retail businesses are attempting to develop and implement GAP standards with varying degrees of success. The government is also developing BangladeshGAP, with the primary goal of exporting more fruits and vegetables to the European Union and other high-value markets. BangladeshGAP is based on a major international standard known as GLOBALGAP. However, experience elsewhere in the world has shown that major retailers in the importing countries tend not to trust locally developed GAP standards. In Kenya the private sector developed KenyaGAP, but buyers in the European Union (EU) and the United States continued to demand GLOBALGAP standards as the minimum entry requirement, which made KenyaGAP of very little use for exports to these markets. In Bangladesh, Shwapno is attempting to promote LOCALGAP, part of the GLOBALGAP family, but it has had little success because the standard is too complex and too expensive for smallholders in Bangladesh to implement. Building a consensus between public and private actors over the objectives pursued by the creation of quality standards is critical. Similarly, the process of developing a standard setting and management system should involve actors all along the agrifood value chain in order to ensure compatibility with current agricultural systems, while also meeting off-taker quality requirements.

PRAN has developed its own GAP standard, known as the PRAN Assured Scheme (PAS), and is supporting its network of growers of tomatoes, mangoes, turmeric, and cassava in implementing it on a trial basis. If successful, PAS will be rolled out to growers of mung, peanuts, ginger, and potatoes. PAS is currently a company-specific standard, but there is scope for the development of a more generic product that could be used by any grower or buyer in Bangladesh.

As PRAN has its own lab facility, it is able to monitor compliance with GAP and food safety and quality practices. However, outside of contract farming arrangements and export-oriented value chains, the monitoring of food safety and quality is difficult, since many companies do not have their own labs and cannot even access lab services. The government, for instance, does not have labs that are accredited for a full range of testing. There are several accredited private laboratories, but their accreditation is also only for a limited number of tests and products.

Market intelligence

Because of the limited market links between farmers and domestic end-buyers, as well as between local agribusiness firms and export markets, information about both domestic and export market requirements in terms of cost, quality, and supply is often not accessible to local agribusiness actors.

PERFORMANCE AND KEY CHALLENGES OF THE BUSINESS CLIMATE

Ease of business, competitiveness, and foreign direct investment

With a rank of 168 out of 190 countries in 2020 and a score of 45, Bangladesh is performing worse than all of its regional peers except Afghanistan (which is ranked 173rd, with a score of 44.1). India ranked 63rd (score of 71), Bhutan, 89th (score 66), Nepal, 94th (score of 63.2), Sri Lanka, 99th (score of 61.8), and Pakistan, 108th (score of 61).¹⁴ The country has low scores across all thematic areas except protecting minority investors (with a score of 72). The country's scores are as follows: starting a business (131), dealing with construction permits (135), getting electricity (176), registering property (184), getting credit (119), paying taxes (151), trading across borders (176), enforcing contracts (189), and resolving insolvency (154). Poor performance on these indicators creates challenges for actors all along the value chain, as seen throughout this report. The issues of difficult and unreliable access to energy, and the high cost for both importing and exporting goods is particularly problematic for exports of perishable food items. Bangladesh also ranks 105th out of 141 countries on the World Economic Forum's 2019 Global Competitiveness Index (WEF 2019), far behind India (68th) and Sri Lanka (84th), but ahead of Nepal (108th) and Pakistan (110th).

These overall business climate and broader competitiveness challenges, combined with other factors, contributed to limiting the inflow of foreign direct investments (FDI) to US\$2.9 billion of net FDI inflow in 2018, slightly higher than those of Pakistan over the same period (US\$2.4 billion) but markedly lower than inflows to India (US\$42.1 billion) (World Bank 2020).

Regulatory environment of the agrifood sector

Enabling the business of agriculture

According to the World Bank's *Enabling the Business of Agriculture 2019* (World Bank 2019a), Bangladesh is performing well and is above the regional average on livestock, plant health, and finance.¹⁵ However, in several other areas

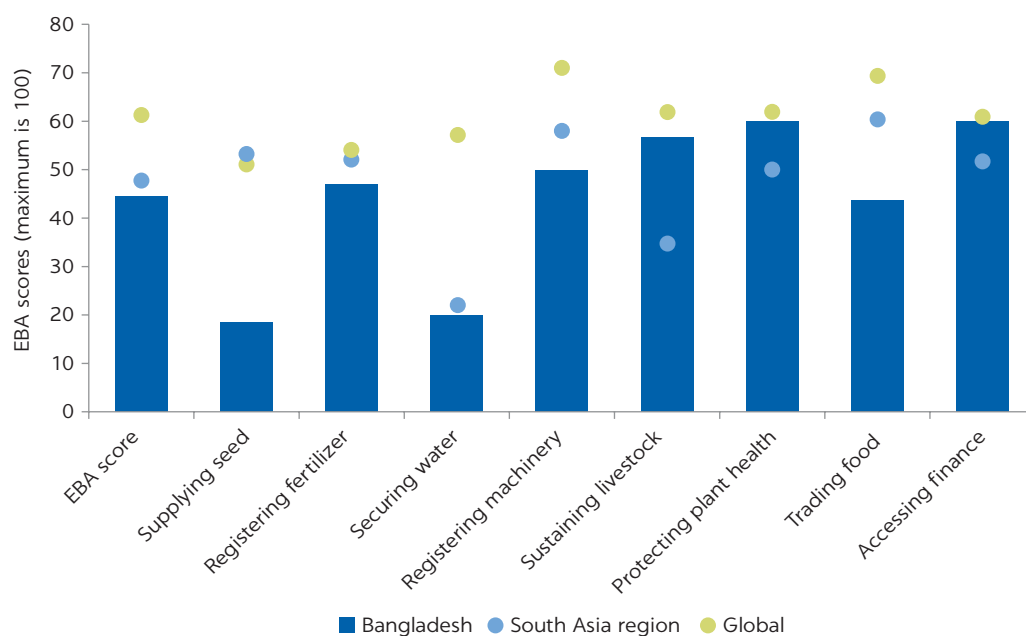
(seed, fertilizer, machinery, agricultural trade, and water), the data show that Bangladesh lags behind its regional peers. In all areas measured by the *Enabling the Business of Agriculture 2019* (EBA) report, Bangladesh scores below the global average when compared to the broader sample of 101 countries (figure 3.10). And although recent regulatory reform was undertaken for the seed sector (for seed certification), EBA data show that private sector participation in the seed market is limited. Agricultural trade regulations in the country do not require burdensome trader-level licensing and membership requirements, and recent reforms to ease agricultural trade by making the necessary documentation available online are noteworthy. Still, the process of obtaining mandatory agriculture-related documents can take up to 150 hours, compared to an average of 45 hours in other countries in the region. This increases the cost of doing business in the agriculture sector.

Food safety

As seen in previous sections of this report, and in figure 3.11, food safety challenges have been hurting Bangladesh's food exports over the past few years. Poor compliance with international food safety and quality standards has led to periodic bans, and a high incidence of alerts for Bangladeshi shrimp imports (UNCTAD 2017). In response to this issue, the government has invested in adopting better management practices, hazard analysis and critical control points, and GAPs; raising awareness of international standards; and food safety infrastructure (FAO 2016). And while considerable improvements have been achieved, compliance monitoring and law enforcement remain weak and irregular.

Exports of horticultural products also often suffer setbacks due to poor compliance with international food safety and quality standards. Between 2002

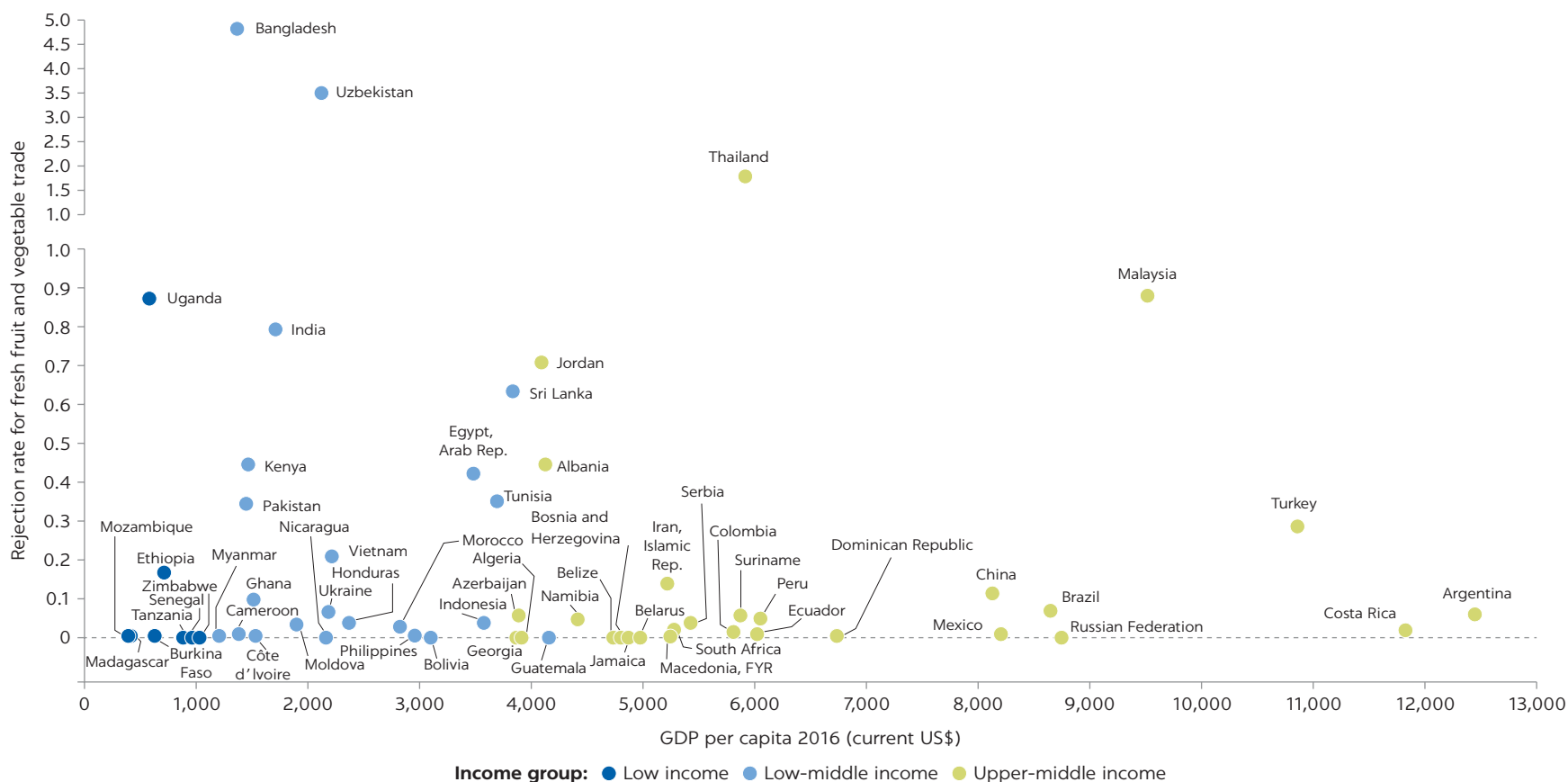
FIGURE 3.10
Bangladesh: *Enabling the Business of Agriculture 2019* scores



Source: World Bank 2019a.

Note: EBA = Enabling the Business of Agriculture 2019.

FIGURE 3.11
Rejection rate for fresh fruit and vegetable trade to the EU (2014–16)



Sources: World Bank, based on EU Rapid Alert System for Food and Feed and United Nations Comtrade data.

Note: The rejection rate by country is calculated as the three-year sum of EU notifications for 2014–16 divided by the three-year sum of fresh fruit and vegetable exports to the EU (in US\$, million) over the same period. The graph shows low-middle-income countries with exports valued at US\$25 million or more. EU = European Union; GDP = gross domestic product.

and 2008, the most common reasons for rejecting Bangladeshi agricultural products, food, and feed for import into the EU were veterinary drug residues, microbiological contaminants, substandard product composition, and mycotoxins (World Bank 2014). Similarly, high rejection rates were reported for products imported into the United States, except for aquatic products, where the levels were medium (World Bank 2014). Unlike in the aquaculture industry, the food safety and quality issues in the export of horticultural products remain unchanged (UNCTAD 2017).

Overall, the enforcement of food safety laws and regulations in Bangladesh is considered weak due to (1) numerous acts, laws, and regulations concerning various food product categories leading to overlaps and complexity in application and enforcement; and (2) overlapping and lack of coordination among the many ministries and agencies involved in the regulation of food quality and standardization. There are 15 ministries involved in food safety and quality control, and 10 involved in food inspection and enforcement (USDA 2019).

Fiscal policy measures

Export subsidies

In an effort to develop exports, Bangladesh has introduced a 20 percent subsidy of the “free on board” value for certain kinds of agricultural produce. Nonetheless, since 2014 potato exports have declined dramatically, and vegetable exports have stagnated. Interviews with potato exporters have confirmed that they were losing money even with the subsidy, while vegetable exporters were surviving only because of the subsidy, indicating that there are persistent cost competitiveness challenges. Overall, the export subsidy has not managed to support sustainable, competitive exportation of the targeted agricultural subsectors.

Fertilizer subsidies

About 80 percent of the fertilizer used in Bangladesh is applied to rice crops (Huang, Gulati, and Gregory 2017), and is very heavily subsidized. The data provided by the Bangladesh Fertilizer Association show that the average subsidy in fiscal year 2018/19 on nitrogen, potassium, and phosphate fertilizer was 40.7 percent. This subsidy is a very significant part of the Ministry of Agriculture’s annual budget of Tk 229.10 billion (about US\$2.7 billion): that is, the subsidy is about 25 percent of the ministry’s total budget (*Dhaka Tribune* 2018).

If these subsidies are applied to the gross margin calculations, then the real margins for field crops are much reduced (table 3.6). The original aim of subsidizing fertilizer was to reduce the farmers’ production costs in order to stimulate rice production. This has worked extremely well, and now Bangladesh is almost self-sufficient. However, it was calculated that in fiscal year 2018/19 season the subsidy came to US\$700 million.

As was discussed in this chapter’s section “Performance and Key Challenges for Support Services,” government subsidies were also focused for many years on nitrogenous fertilizers, which led to an imbalance in the use of nitrogen, but this has later been counterbalanced by an increase in subsidies for potassium and phosphorous macronutrients. Still, the evidence shows that almost half of the farmers are overusing fertilizers, with no associated increase in productivity; this high level of consumption of fertilizer raises the risk of negative impacts on the environment, health, and even farm productivity through resource degradation (Gautam and Faruquee 2016).

TABLE 3.6 Projected gross margins, assuming real cost of fertilizer in Bangladesh

CROP	GROSS MARGINS (US\$ PER HECTARE)	
	SUBSIDIZED FERTILIZER	UNSUBSIDIZED FERTILIZER
Maize	412	298
Soybean	238	53
Rice: boro	-71	-171
Rice: aman	114	40
Rice: aus	126	53

Source: Sergeant and Graffham 2020.

SUMMARY OF KEY CROSS-SECTORAL CONSTRAINTS

As discussed in the preceding section, the challenges to increased diversification of the agriculture sector in Bangladesh span the entire agrifood ecosystem, with various constraints specific to individual nodes of the value chain; some are related to support services, and some stem from the country’s business climate. When considering the diversification and modernization objectives for the sector, these constraints can be organized into three broad categories: (1) on-farm productivity constraints, (2) off-farm value addition and commercialization constraints, and (3) cross-sectoral enablers.

On-farm productivity constraints: Supply, or “push” factors

As seen in chapters 1 and 2 and the first section of chapter 3, when compared to its regional peers and world averages, Bangladesh is currently not competitive in terms of its yields for many products, with the notable exception of paddy rice. Bridging these productivity gaps will be essential in order to increase production and on-farm cost competitiveness for these products, as the sector seeks to diversify away from rice.

The key constraints to increasing productivity for nonpaddy rice products are shown in figure 3.12 and are described afterward.

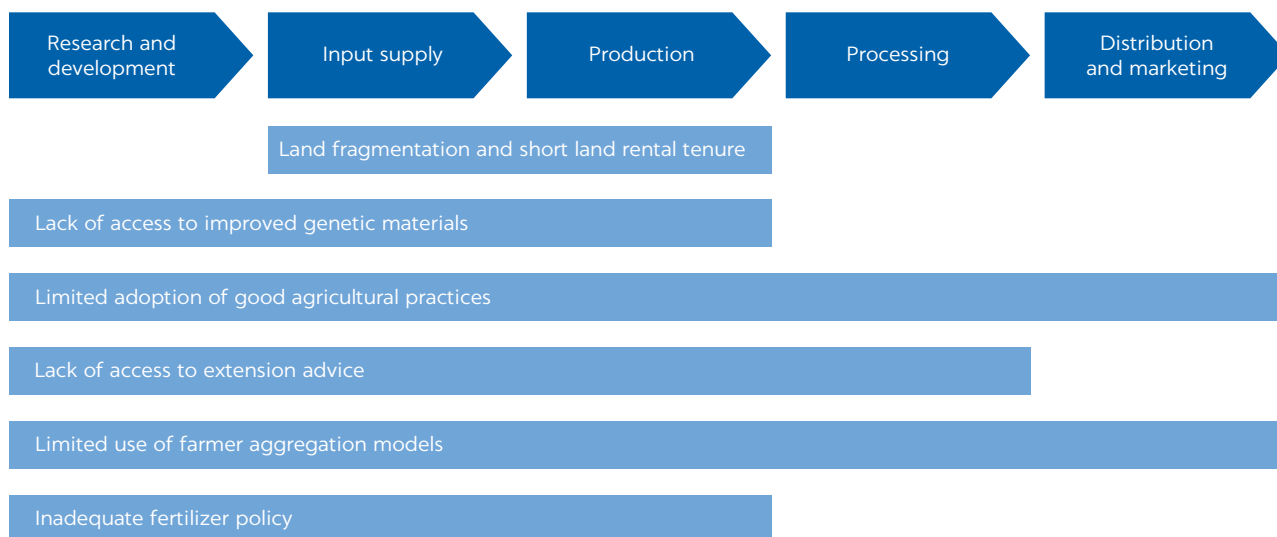
Land fragmentation and short tenure of land rentals

Land fragmentation limits economies of scale. Land rentals can be used to circumvent this challenge, but the typical tenure of land rental is limited to three years, which is not conducive to investment in certain crops. For example, tree crops require sizeable upfront investments and can generate high returns only after five to seven years. This situation also discourages the intermittent use of cover crops to replenish the soil, as farmers are not confident they will be able to benefit from doing so.

Lack of access to improved genetic materials

Research and development from the public and private sectors have been mostly focused on paddy rice over the past few years, with little support for developing varieties of other crops that can adapt to Bangladesh’s agroclimatic conditions. There is a need to remove the regulation preventing private sector actors from breeding and producing seeds for notified crops. There is also a need to increase public-private coordination on developing a high-quality seed supply for

FIGURE 3.12

On-farm productivity constraints along the agrifood value chain

Source: World Bank.

notified crops, and to increase market transparency regarding the quality and effectiveness of seeds in the market. This is important in order to drive greater demand for improved genetic materials from farmers, which should in turn encourage the private sector to invest in this field.

Limited adoption of good agricultural practices

GAPs are by and large not being implemented in Bangladesh. This is most notably illustrated by the misuse and overuse of certain inputs, like fertilizer. It can also be seen in the challenges downstream of the value chain in the effects on food safety, notably in the high levels of pesticide residue in certain subsectors. This challenge is closely connected to the limited availability of extension advice and the limited use of aggregation models.

Lack of access to extension advice

Providing timely and relevant information to farmers is made difficult by an inadequate extension system. The Department of Agricultural Extension (DAE) resources, and current extension techniques and materials need improvement in order to meet the challenges of low levels of literacy and farm fragmentation. With around 15 million farms to reach, and very limited use of aggregation models, the difficulties of outreach are compounded by the current lack of articulation between extension efforts provided by the public and private sectors and by the limited use of digital technology to provide extension advice.

Limited use of farmer aggregation models

Neither formal aggregation mechanisms, such as cooperatives, nor informal mechanisms are widely used in Bangladesh; this contrasts with the situation in many other countries. It creates challenges for the delivery of extension services, for access to finance, and for developing joint infrastructure, as well as for aggregating products for marketing. It also presents off-takers with additional logistical costs and challenges. Some off-takers, like PRAN, are developing aggregation mechanisms in order to be able to secure quality inputs more consistently.

Inappropriate fertilizer subsidy policy

The current fertilizer subsidy policy appears to be leading to an overuse of fertilizer, which is raising environmental, health, and even productivity risks due to land degradation, while bringing no increase in output. This policy is also very costly; this suggests an opportunity to redirect this support and apply it to other activities that could do a better job of increasing productivity for paddy rice, as well as other crops, in a more sustainable way.

While these productivity constraints create impediments for serving both the domestic and export markets, the limited use of farmer aggregation models and GAPs are particularly problematic in terms of meeting the quality standards required by export markets.

Off-farm value addition and commercialization constraints: Demand, or “pull” factors

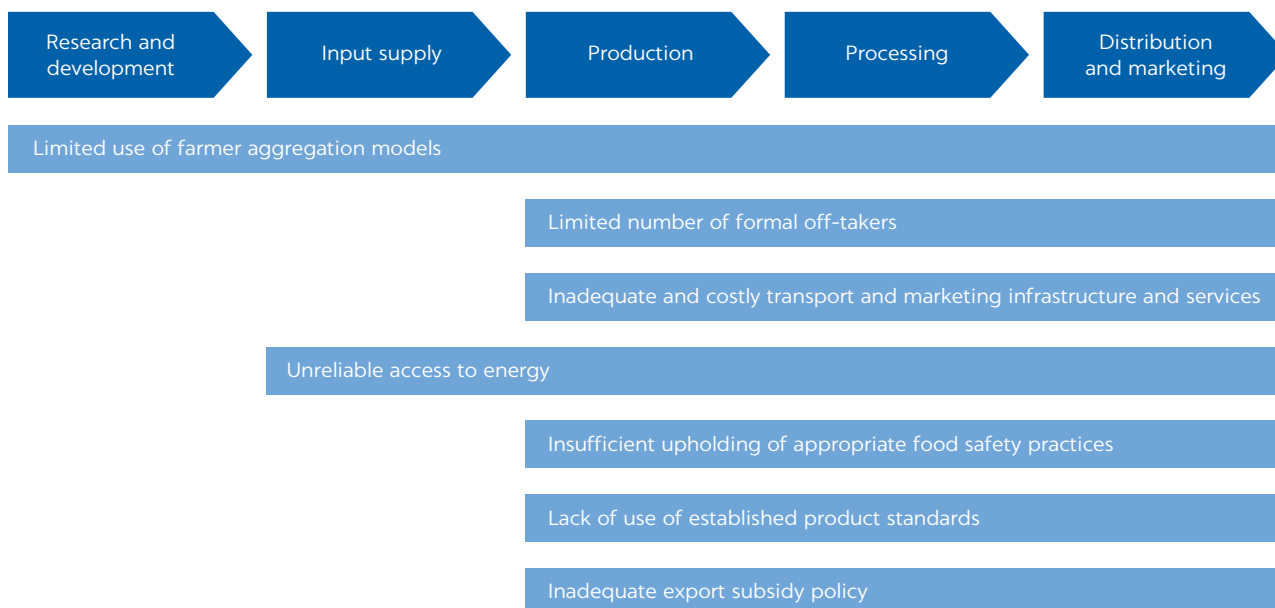
Another set of constraints also impacts the demand for more diversified production of food products, and the signaling of the increased demand of higher-value crops to farmers who are currently not switching to higher-value crops. The key constraints for increasing off-farm value addition and improving commercialization for nonpaddy-rice products are shown in figure 3.13 and described in greater detail afterward.

Limited use of farmer aggregation models

Just as the lack of aggregation channels for farmers constrains their ability to increase productivity, it also further disconnects them from end buyers like food processors and exporters.

Limited number of formal off-takers

There is also a dearth of well-established formal off-takers: that is, food processors, formal distributors like supermarkets, or exporters. This limits

FIGURE 3.13**Off-Farm value addition and commercialization constraints along the agrifood value chain**

knowledge transfers, as well as the use of higher quality standards in the market. Higher quality standards typically translate into higher prices for farmers, lead to a consistent supply of quality products, and incentivize farmers to invest in producing higher-value crops.

The development of more formal distribution channels for food products depends, however, on both supply and demand factors. Limited demand from consumers for more convenient, higher-quality, and safer food results in the overwhelming majority of the retail of food products in Bangladesh taking place in wet markets as opposed to supermarkets. For a number of reasons, domestic food processors and exporters are not always able to meet the cost and quality requirements for domestic and export markets. Some of the main constraints that representatives of agribusinesses mentioned during stakeholder consultations included limited access to finance, weak food quality and safety standards, poor marketing and logistical infrastructures (such as cool chains and cold storage), costly logistical services, the limited use of GAPs among farmers, and the lack of high-quality modern seed varieties.

Inadequate and costly transportation and marketing infrastructure and services

As discussed in the “Performance and Key Challenges of the Business Climate” section of this chapter, the transportation and logistical infrastructure and services are poor in Bangladesh, which results in higher cost for actors along the agrifood value chain. The marketing infrastructure is also inadequate, which leads to heightened food safety risks. Finally, importing and exporting products is more time consuming and costly than in most countries, which affects both the cost and the quality competitiveness of exportation of perishable products.

Unreliable access to energy

Access to electricity is unreliable, with repeated outages; this is particularly damaging for food processing, as it damages equipment and requires supplementing the grid with generators. It also creates challenges for maintaining cold chain operations along the value chain (for example, with potato seeds).

Insufficient upholding of appropriate food safety practices

Food safety challenges have greatly penalized Bangladesh’s food exports. Despite efforts to address these issues, compliance monitoring and law enforcement remain weak and irregular for exports. On the domestic market, food safety practices are not being properly and consistently enforced along the country’s mostly informal distribution channels, which creates an unlevel playing field for formal retailers, and creates health risks for consumers. The complexity in both the legal and regulatory frameworks, with a confusing and sometimes overlapping array of acts, laws, and regulations, and the control and enforcement system, with multiple ministries and agencies in charge of various aspects, are contributing to the prevention of significant improvements in food safety outcomes in the country.

Lack of product standards

To protect consumers, domestic product standards need to be tailored to domestic market conditions, while ensuring that value-chain actors are able to eventually comply. Access to certification services in order to meet export standards can present challenges for exporters as well.

Inadequate export subsidy policy

The export subsidy policy does not appear to be leading to sustainable exports of horticultural products; indeed, exports are either decreasing or are being maintained thanks only to the subsidies. There is an opportunity to redirect this support to other public good activities that could better assist in achieving increases in exports by improving cost and quality competitiveness of the country's food exports, rather than mitigating the lack of cost competitiveness with a subsidy.

Other cross-sectoral issues: Enablers along the agrifood value chain

Other cross-sectoral constraints also impact the competitiveness of the agrifood sector across the board.

Constrained access to finance for value-chain actors

According to the Bangladesh Krishi Bank's estimates, the demand for agricultural financing exceeds current supply by two to three times. According to IFC calculations, the financing gap for nonfarm MSMEs is also estimated to be very wide, at about US\$2.8 billion.

On the agrifinance side, financial products are limited to basic seasonal and short-term loans, with a number of constraints that prevent greater financial inclusion. For example, there are some misaligned eligibility criteria that require land ownership or a guarantee from the landlord to use land as collateral. The perception of high risks also drives high interest rates, and in general there is a limited number of financial products and services that are tailored to farmers.

Many challenges have been identified regarding the financial infrastructure's ability to achieve market-driven MSME financial inclusion, including the need to (1) increase the credit bureau's coverage to include all commercial loans, regardless of value, and use all available data to improve MSME credit information; (2) expand the collateral registry's mandate to include moveable collateral for secured lending (beyond the current use of only property-based collateral); (3) enact the Secured Transactions Law and create a register; and (4) improve insolvency and debt resolution solutions.

Broader challenges: Investment climate and competitiveness

As shown in the country's performance, according to the Ease of Doing Business Report, and the Global Competitiveness Index, overall improvements are needed in the country's investment climate. These challenges are notably contributing to limiting the inflow of foreign direct investments, which would greatly benefit the agrifood sector in terms of knowledge transfers; the structuring of domestic value chains; and the ability to target and meet export market requirements.

The production, commercialization, and cross-sectoral constraints demonstrate how each factor hinders agricultural competitiveness and productivity. The public and private sectors have an important role to play in achieving agricultural diversification and modernization. Chapter 4 uses three different value chains to show how the various constraints are limiting value generation and distribution.

NOTES

1. With the exception of higher yields for rice paddy and a few other crops.
2. The ASTI database includes Bangladesh, Cambodia, China, India, Lao People's Democratic Republic, Malaysia, Nepal, Pakistan, Sri Lanka, and Vietnam from the Asia-Pacific Region.
3. See analysis of the business climate as it relates to the agrifood sector in section "Regulatory Environment in the Agrifood Sector" in this chapter.
4. The Food and Agriculture Organization of the United Nations (FAO) defines smallholder farm sizes as 2.0 ha or less. In Bangladesh, farms are grouped into three categories: (1) small farms are those with landholdings of below 1.01 ha, (2) medium farms have between 1.01 ha and 3.03 ha, and (3) large farms have 3.04 ha and above.
5. Land levels are broadly grouped into highland, above the normal flood level; medium highland, normally flooded to a depth of up to 90 centimeters (cm) during the flood season; medium lowland, normally flooded 90–180 cm; lowland, normally flooded 180–300 cm; very lowland, normally flooded deeper than 300 cm; and bottomland, wet throughout the year.
6. Pumping using electricity or solar power (not diesel).
7. Five crops—rice, wheat, potato, jute, and sugarcane—are considered as notified crops in Bangladesh due to their importance in terms of food security. Seed segments of these notified crops are highly regulated in the country.
8. Farming models are described in greater detail in chapters 1 and 2.
9. A notable exception has been the rapid expansion in ponds for aquaculture.
10. See analysis under "Distribution and marketing" in a following subsection.
11. The processing consists mainly of slaughtering the animals and butchering the carcass into different cuts prior to freezing or chilling.
12. See World Bank, Ease of Doing Business Index database, Washington, DC: World Bank. <https://data.worldbank.org/indicator/IC.BUS.EASE.XQ>.
13. On average, there is one major crash requiring significant repair, and several minor crashes a year. The main reason for crashes is unskilled drivers.
14. World Bank, Ease of Doing Business Index database.
15. The other countries in the region covered by the report are Afghanistan, India, Nepal, Pakistan, and Sri Lanka.

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4 Agricultural Diversification and Modernization

LESSONS FROM THREE SELECTED PRODUCTS

INTRODUCTION

Through an in-depth analysis of three different products and their value-chain ecosystems, this report demonstrates how the selected crops—maize, potatoes, and mangoes—are affected by the constraints discussed. The analysis focuses on identifying policies, institutions, logistics, and financial bottlenecks, particularly cross-sectoral constraints—that are holding farmers back from diversifying into high-value crops shown to have high margins. This chapter presents strategic opportunities to stimulate several products by addressing cross-sectoral constraints including market access models, food safety and standards mechanisms, marketing and distribution infrastructure, and good agricultural practices (GAPs) like the efficient use of fertilizers.

THREE PRODUCTS: MAIZE, POTATOES, AND MANGOES

The discussion in chapter 2 demonstrated that there is potential for productive agricultural diversification in Bangladesh, with a range of nonpaddy crops that can generate greater profit margins than rice. The discussion in chapter 3 showed that, nevertheless, there are multiple cross-sectoral constraints that may contribute to hindering this diversification process. Indeed, most farmers are continuing to grow rice, and the progress toward diversification is rather slow. To understand why progress toward productive diversification in the country is so slow, it is necessary to identify the policies, logistics, and financial bottlenecks that are holding farmers back from moving toward a more diversified system, and preventing their integration into the modern agrifood value chains. This requires an in-depth assessment of value chains and markets for selected non-paddy agricultural commodities.

Agricultural commodities where Bangladesh already has some competitive and comparative advantages against their peers in the region and among the low- and middle-income countries were prioritized. The yield advantages and

revealed comparative advantages (RCA) for the country's major agricultural commodities are presented in table A.4 in appendix A.

Comparison of yields in Bangladesh versus world averages shows Bangladesh's on-farm competitiveness for only eight products. The RCA is an indication of export competitiveness, and for Bangladesh it shows nine products as being promising. For both indicators, certain distortions, like subsidized inputs boosting on-farm productivity, may be affecting the results. For example, a low RCA with a high yield ratio could be indicative of more robust domestic demand for the commodity relative to competing exporters of that commodity, the inability to expand production beyond current production, and/or compelling challenges between farm and port that reduce global trade competitiveness in spite of high farm-level competitiveness.

On the other hand, a low yield ratio but high RCA could be indicative of policy - level factors (for example, subsidies or state-owned enterprise dominance) that can contribute to global trade competitiveness even while farm productivity is low. Based on these results and other development impact criteria, maize, potatoes, and mangoes were chosen for further assessment. These products were selected for their relevance to large numbers of farmers as well as their possible potential for development as exports.

Further assessment of these crops provides some insights about subsectors:

- *Crops for inclusion in livestock feed.* Bangladesh has a thriving and expanding livestock and fish sector that requires supplementary feed, which is being manufactured by local factories based on a mixture of locally grown and imported raw maize and soybeans. Maize and soybeans, like rice, are field crops and do not require significant additional management skills. The growing season of maize is also short compared to that of rice, and these crops represent good opportunities for import substitution.
- *Annual vegetable crops.* Horticultural crops require greater technical and managerial skills to grow and market because they are much more perishable. Investigation concentrated on bottle gourds (calabash), tomatoes, and potatoes because they represented an opportunity to research several issues, including postharvest losses, marketing infrastructure, exports, cold storage, and packaging. These crops are produced mainly for the local market, but efforts have been made to export both bottle gourds and potatoes. Tomatoes and potatoes are also being increasingly grown for processing; potatoes have a much more sophisticated marketing chain, using privately owned cold stores.
- *Perennial fruit crops.* These require a significant upfront investment because of the need to establish an orchard (about US\$1,000 per hectare in the case of mangoes). Mangoes are the most widely grown perennial fruit crop in Bangladesh, and efforts are being made to develop it for export and processing.

The key objectives of the detailed assessment in this chapter are the following:

- Map out the main elements of the agrifood value chain for each of maize, potatoes, and mangoes and provide a clear understanding of common, cross-cutting bottlenecks in policies, institutions, logistics, and financing.
- Identify markets that demonstrate the best opportunities for growth and have potential for productive diversification in the agriculture sector. Also, identify market-led opportunities for value chain improvements in postharvest

handling and improved packaging, grading, standards, processing, and modern retail operations.

- Make the recommendations for increased diversification and modernization of the agrifood sector (presented in chapter 5) more evidence based.

LIVESTOCK FEED INGREDIENTS: MAIZE

Overview

Demand for formal livestock feed will continue to be buoyant as a result of the increasing demand for meat, milk, and eggs. There are about 65,000 to 70,000 poultry farms in Bangladesh, with a growth rate of about 9 percent annually (USDA 2019). In addition, there are around 2 million fishponds and farms, and the area of fishponds has been increasing by about 3 percent annually since 2004. Fish is the dominant protein consumed by the Bangladeshi population (figure 4.1); chicken is in second place, and the consumption of chicken has been growing steadily since late 1990s. Bangladesh has a growing livestock feed industry, with about 85 businesses producing most of the country's demand for livestock feed. A considerable portion of the cattle feed comes from grazing; the main markets for livestock feed are therefore the inland fish and poultry industries. The main ingredients of livestock feed are 55 percent to 65 percent carbohydrates, typically maize, and around 25 percent protein, usually soybean cake, but rapeseed, mustard cake, or fish meal can also be used.

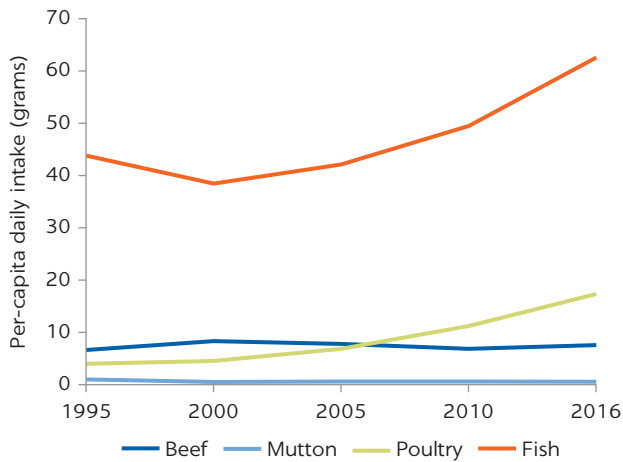
Trade

Imports of maize, soybeans, and soybean cake have increased since 2009. In 2018 about 1.7 million tons of maize, 1.3 million metric tons (MTs) of soybeans, and 300,000 MTs of soybean cake were imported; the value of these imports was US\$293 million (maize), US\$496 million (soybeans), and US\$144 million (soybean cake) (figure 4.2). Currently, the main source of imported maize is Brazil (66 percent in 2018), with smaller amounts coming from India (16 percent) and Argentina (11 percent). The supply of soybeans and soybean cake is dominated by the United States (about 90 percent in 2018), with smaller amounts coming from Brazil and Canada. Virtually all maize and soybean cake are used by the animal feed industry; the oil is removed from the soybeans before the byproduct (the cake) is used in the feed industry. To encourage the local vegetable-oil extraction industry, imports of soybean cake incur a 10 percent import duty, whereas soybeans and maize are imported duty free. A consortium of four or five livestock millers imports boatloads of maize and then distribute it among themselves. They tend to buy soybean cake directly from the vegetable-oil extraction companies because it is cheaper than importing it and paying duty, but about 25 percent to 30 percent of the soybean protein is imported directly.

Production and processing

Maize in Bangladesh is grown during *boro* season (usually displacing some of the rice crop); it has expanded rapidly in recent years, from around 700,000 MTs in 2009, to an estimated 3.5 million MTs in 2017 (figure 4.3). The rapid expansion

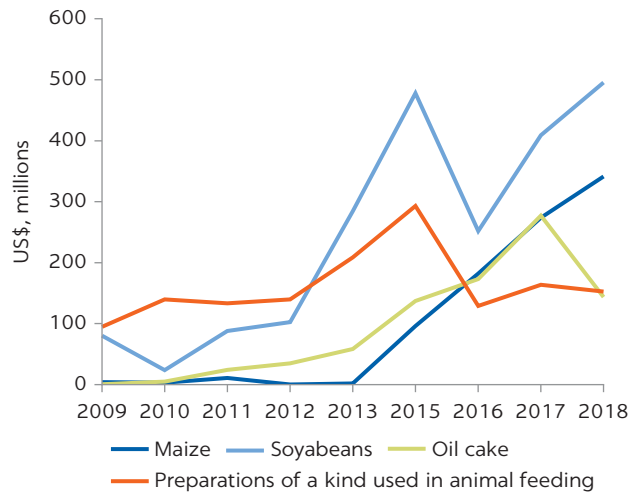
FIGURE 4.1
Human protein consumption



Source: BBS 2017.

Note: The relevant data for 2014 are not available in UN Comtrade and thus excluded from the figure.

FIGURE 4.2
Imports of livestock feed ingredients



Source: UN Comtrade 2020.

Note: The relevant data for 2014 are not available in UN Comtrade and thus excluded from the figure.

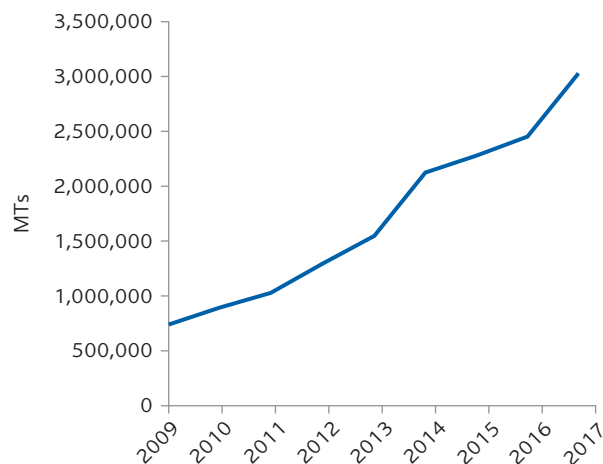
is attributed to attractive prices, coupled with the poor margins associated with boro rice. Interviews with farmers have also confirmed that, despite a long tradition of rice production, the higher gross margins that can be achieved with maize make it more attractive to them.

The rapid expansion of maize suggests that the potential for higher margins outweigh the benefits of home food security and the risk associated with growing a crop with which they have less knowledge and expertise. Maize is almost entirely used in the animal feed industry; most of it is grown in clusters near feed mills that buy it soon after harvest, either for immediate use or for storage in silos. Despite increasing demand for soybeans and soybean cake, the growth in local production has been less impressive, and for the past few years has been static at around 90,000–100,000 MTs per year (figure 4.4). This is attributed partly to its smaller projected gross margins (see table 2.5, chapter 2). According to farmers and Department of Agricultural Extension officials, it is also due to agronomic issues,¹ such as soybean varieties that were not well adapted to the local environment, and poor nodulation on the roots, which could be associated with not using rhizobium inoculum at planting.

Distribution and marketing

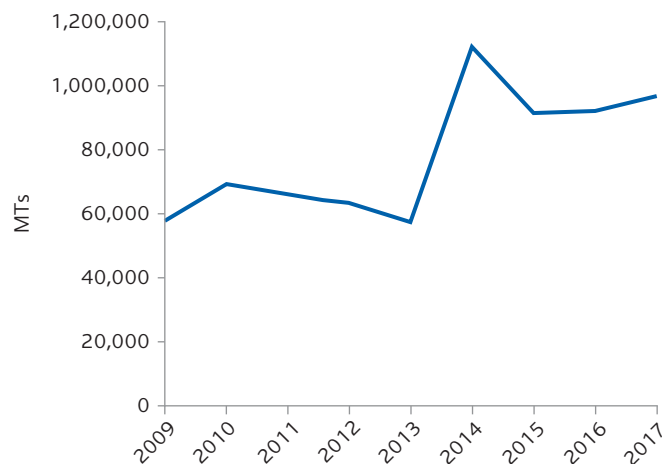
The potential market opportunity for increased maize production would be to substitute it for imports, which, based on 2018 data, would be about 1.7 million MTs. Given that maize is more profitable than boro rice sold for cash, this would mean an extra US\$110 million generated in the rural economy and would reduce imports by US\$300 million. However, the country would produce about 900,000 MTs less rice, which would result in increased costs for imported rice. The main driver in the maize value chain is the livestock milling companies, which consume virtually all locally produced crops

FIGURE 4.3

Maize production in Bangladesh

Source: FAO 2020.
Note: MTs = metric tons.

FIGURE 4.4

Soybean production in Bangladesh

Source: FAO 2020.
Note: MTs = metric tons.

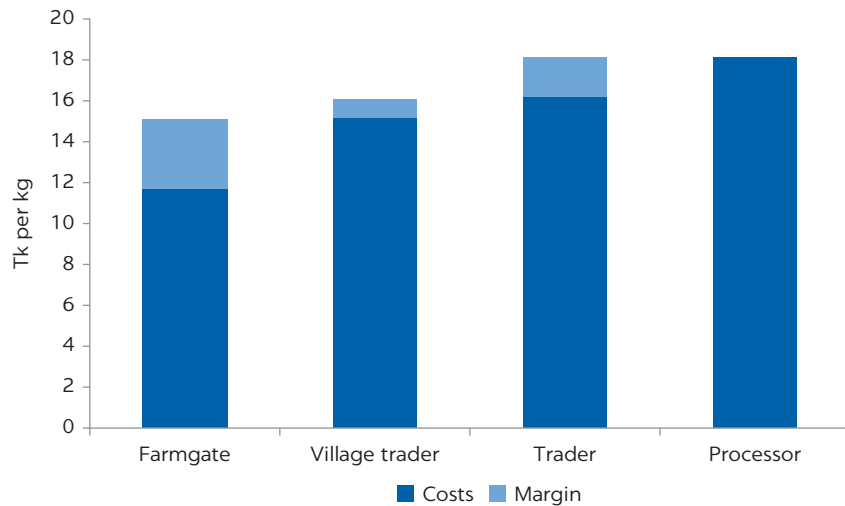
and effectively set the market price, which is based on import parity. Currently, groups of milling companies cooperate to import boatloads of maize; world prices are about US\$170–175 per MT at the port of origin, and the logistical costs of shipping to Chittagong are about US\$30 per MT. Internal transport and other costs result in a delivered-to-factory price of about US\$230 MT, the equivalent of Tk 19.5 per kilogram (kg). During the field mission, farmers reported that they had received Tk 15.0 per kg (US\$176 per MT).

The marketing chain of locally produced maize is relatively straightforward. Farmers deliver to village-based traders who own a warehouse and who are in effect aggregators because they bulk the grain from several farmers in their locality. When village-based traders have gathered a truckload (generally about 7–15 MTs), they negotiate its sale to traders or agents (often referred to as *beparis*) from the milling companies, who then transport it to the mills. Some large animal feed mills have storage silos to hold enough stock to keep the factory operational.

The maize marketing chain is relatively simple: Farmer → village-based aggregator → large-scale trader → feed-mill processor → distributor → clients.

Within the value chain, farmers gain the largest margin share (figure 4.5). A quick review of the marketing chain shows that it is both competitive and efficient. The barriers for entry to this chain are minimal; obviously a farmer would need some access to land and inputs, and the village-based aggregator would require a shed capable of holding up to about 15 MTs of maize, as well as access to short-term financing. On average, about 15 to 20 village-based traders compete to buy maize from the farmers in a village. The farmers also request price information from various traders to ensure that they are getting a fair price. The agent who is linking with the factory requires financing and access to trucks in order to start the business. All transactions are based on cash, and there are no structural barriers to setting up a business at any stage.

FIGURE 4.5

Buildup of costs along the maize marketing chain

Source: Sergeant and Graffham 2020.

Note: Tk = Bangladesh taka, kg = kilogram.

Main lessons learned

The following are the main observations from the assessment of the livestock feed value chain:

- There are local market opportunities and high profit margins for farmers. Market opportunities exist for replacing imported maize and soybeans. Attractive gross margins have encouraged farmers to rapidly expand their production of maize, but some issues still need to be addressed before soybean production can increase.
- Unlike many other value chains, the maize value chain has reliable off-takers. This value chain is driven by a limited number of feed millers, who see local products as a good alternative to imported ones and who have actively established systems for procurement. Domestic maize production could be boosted further if the feed millers had support for increasing their storage capacity.
- More research and development on both maize and soybeans are needed. Agronomic research is needed in order to seize the market opportunity for soybeans. A comprehensive research program to identify higher-yielding varieties, identification of the best soils and climates, and a better understanding of nitrogen-fixing rhizobium would benefit farmers. Agronomic research into soybeans should be undertaken in collaboration with vegetable-oil processing companies, with the aim of producing the crop domestically. Maize production would also benefit from further varietal research, especially in an era of climate change.
- Land fragmentation and short land rental tenures are preventing economies of scale. In most countries, maize and soybeans are grown by large-scale farmers using mechanization. In the long term, such efforts should be made in Bangladesh in order to gain economies of scale.

VEGETABLES: POTATOES

Overview

Total vegetable production in Bangladesh was reported as 3.88 million MTs in 2017, and has grown by around 5.5 percent annually since 2008 (figure 4.6). This increase in production is in response to an increase in demand, which is in turn driven by increases in disposable income and population growth (1 percent annually) (Gautam and Faruqee 2016). Potato data are recorded separately in Bangladesh; in 2017, the country produced just over 10 million MTs, a figure that almost doubled between 2009 and 2017 (figure 4.7). Much of the increased potato production is derived from yield increases, from 13.3 MTs per hectare in 2008 to 20.4 MTs in 2017.

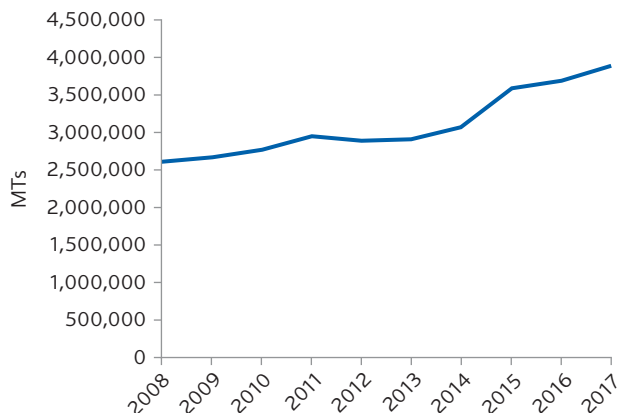
PHOTO 4.1

A vegetable nursery in Rangpur



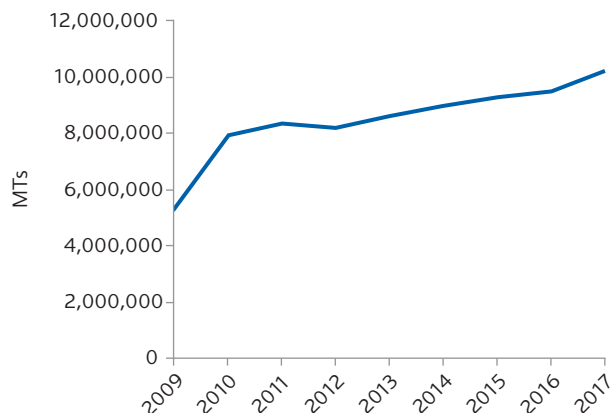
Source: © Andrew Graffham. Used with the permission of Andrew Graffham. Further permission required for reuse.

FIGURE 4.6
Total vegetable production, 2008–17



Source: FAO 2020.
 Note: MTs = metric tons.

FIGURE 4.7
Total potato production, 2009–17



Source: FAO 2020.
 Note: MTs = metric tons.

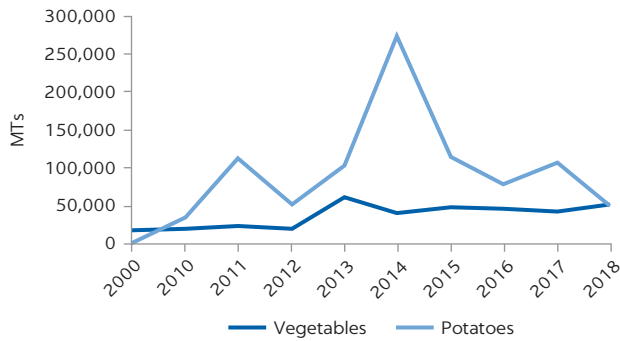
Trade

There have been considerable efforts to develop the country's export markets, encouraged by a government subsidy of 20 percent of the free on board (FOB) value, as well as by various projects. The volume of vegetable exports has been more or less constant, at around 50,000 MTs annually, with a value of around US\$40 million per year (figure 4.8 and figure 4.9). Exports used to be predominantly to the European Union (EU), but have dramatically reduced, to about 2,000 MTs per year, worth only about US\$8 million in fiscal year (FY)2017/18 (figure 4.10). Sales to the EU have been constrained by an inability to maintain sanitary and phytosanitary standards (for example, pesticide residues on some of the products), leading to bans on some product lines. Between 2000 and 2014, about 10 percent of the total alerts issued for imports into EU markets was for Bangladeshi shrimp products, and 30 percent of these notifications were on-border rejections (UNCTAD 2017). Potato exports have also fallen dramatically since 2014 (figure 4.11). Exporters face serious competition in export markets, in terms of both price and quality, despite the government export subsidy. On the contrary, imports of fruits and vegetables have grown substantially, over 11 percent annually, and major sources of imports are Australia, Canada, China, and India (figure 4.12).

Production and processing

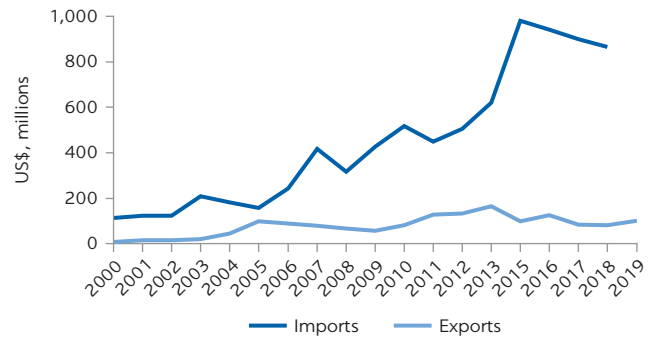
Bangladesh grows a wide range of vegetables, the most popular being eggplant (*brinjal*) and tomatoes, which have shown very rapid expansion since 2008 (figure 4.13). More traditional vegetables, such as cabbage and cauliflower, have also gained in popularity. Most of these grow best in the cool, dry *rabi* season from October to March, when the temperatures are better for growth and there is less pest and disease infestation. The much higher gross margins for these annual vegetables than for rice make them attractive to some farmers. However, they do require greater management and technical skills, which makes them much riskier and might deprive some farmers of some of their

FIGURE 4.8
Vegetable and potato exports, 2009–18



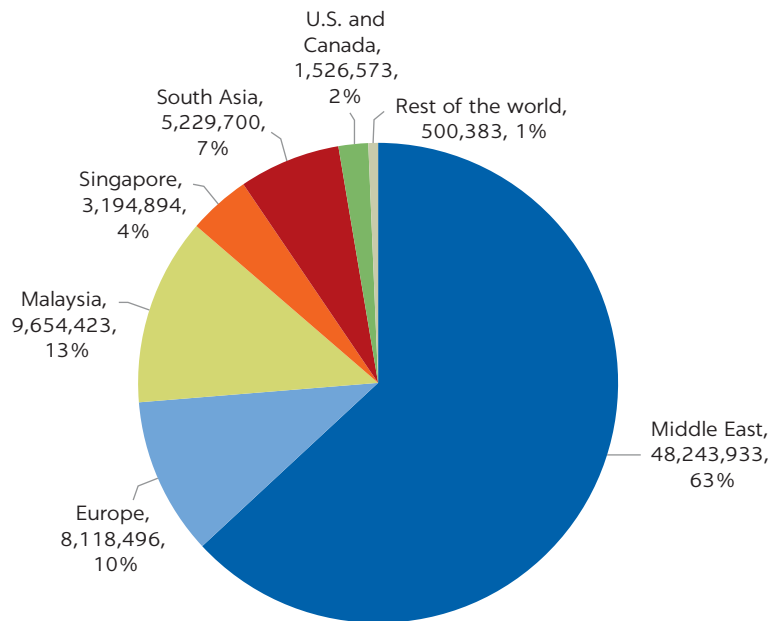
Source: UN Comtrade 2020.
Note: MT = metric tons.

FIGURE 4.9
Fruit and vegetable trade, 2000–19



Sources: UN Comtrade 2020; EPB 2020.
Note: The relevant data for 2014 are not available in UN Comtrade and thus excluded from the figure.

FIGURE 4.10
Destinations of vegetable and fruit exports, FY2017/18
US\$, percentage share

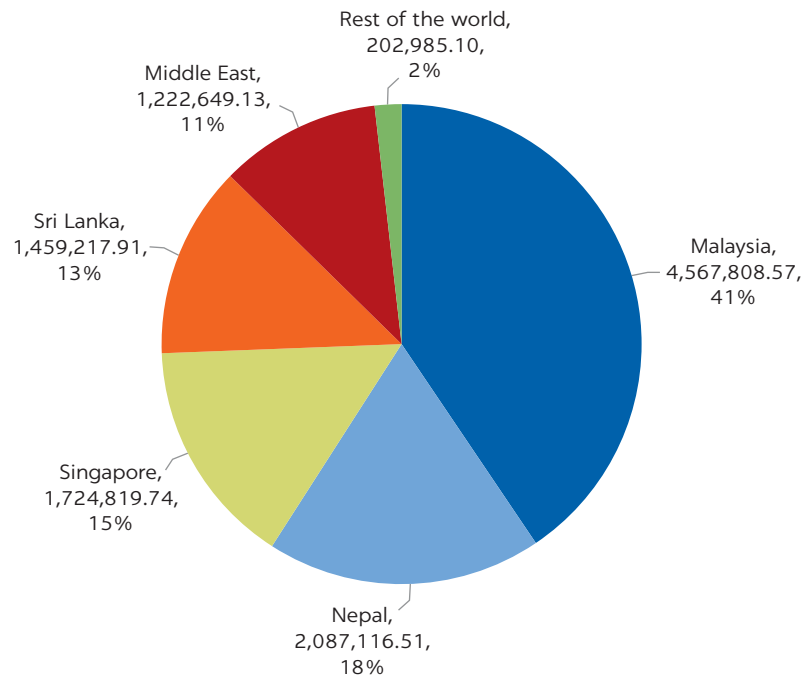


Source: EPB 2020.
Note: FY = fiscal year.

staple food security. These vegetables are also highly perishable, and their prices are relatively volatile, so the marketing of them can be problematic. However, entrepreneurial farmers who live close to major markets can generate profits by growing vegetables.

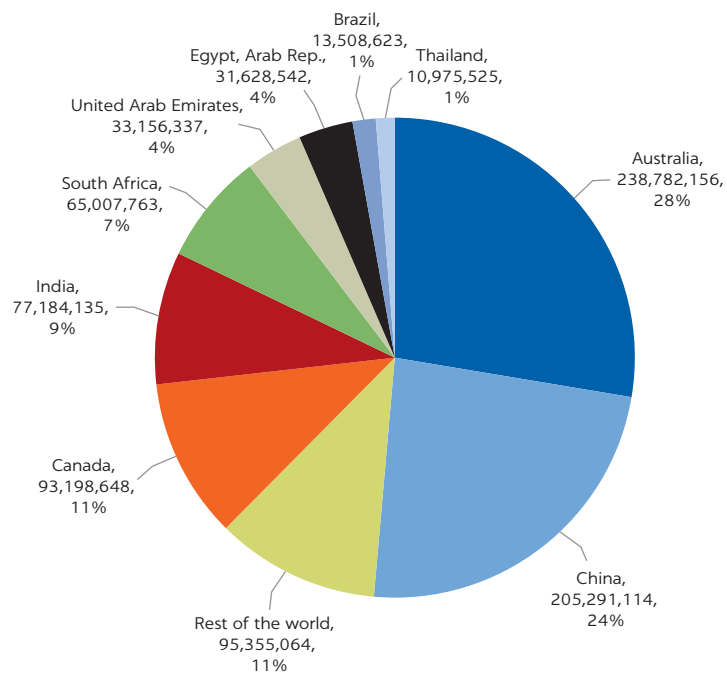
Potatoes are a temperate crop; therefore, they perform well in the winter season. In Bangladesh the winter is too short for potatoes to reach their yield potential. In most countries with well-established potato industries the crop is allowed to mature over 120 days, but in Bangladesh potatoes can be grown for only 90 days. This cool season also coincides with the time of the year when

FIGURE 4.11
Potato export destinations, FY2017/18
US\$, percentage share



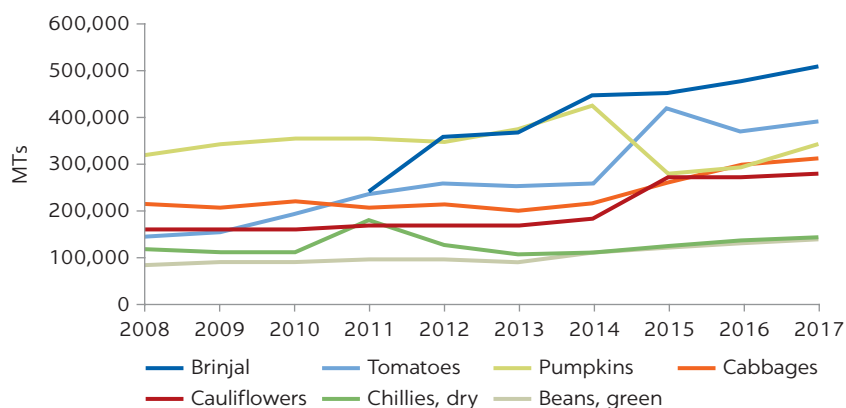
Source: EPB 2020.
 Note: FY = fiscal year.

FIGURE 4.12
Sources of imported fruits and vegetables, FY2017/18
US\$, percentage share



Source: UN Comtrade 2020; and EPB 2020.
 Note: FY = fiscal year.

FIGURE 4.13
Vegetable production by type, 2008–17



Source: Sergeant and Graffham 2020.
 Note: MTs = metric tons.

there is the least number of sunshine hours; therefore, there is less time for photosynthesis to occur. Together, these climate disadvantages mean that potato yields in Bangladesh are well below those attained in the main potato-growing countries.²

Potatoes tend to be grown on a larger scale by better-resourced farmers; in Bangladesh the average size of a potato farmer's land is 1.76 hectares, of which only 1.14 hectares is arable. This is exceedingly small by international standards. Most of the potatoes in Bangladesh are sold at harvest time, and the rest are put into storage for a few months at ambient temperatures. It is estimated that about 4 million MT (about 40 percent of the total crop) are stored in over 390 privately owned, dedicated cold stores; this is an essential service needed to keep the market supplied with potatoes throughout the year.

Distribution and marketing

Vegetables are grown and consumed throughout the country. Dhaka is the largest end market, but other cities are also important. The main vegetable marketing channels are still the traditional wet markets; supermarkets are increasing, but from a very low base. A rapid assessment of the market for vegetables shows a competitive chain through which vegetables are harvested and transported rapidly throughout the country. The largest proportion of vegetables consumed in Bangladesh is supplied from local village markets; the farmer often takes the produce to the nearest market, where it is often sold directly by the farmer or a trader. Because of the very small average farm and field sizes, most farmers do not produce enough vegetables to justify marketing them directly to wholesalers. Therefore, they rely on market intermediaries to aggregate and transport the vegetables to urban wholesale markets, where the consignments are broken down and sold to retailers in traditional kiosks.

Postharvest losses for fruits and vegetables were found to be reasonable. Gautam and Faruquee (2016) found that physical postharvest losses were less than 5 percent. Good progress has also been made in recent years in adopting improved packaging; the use of plastic crates and trays is now widespread and has helped to maintain product quality and reduce losses. However, more

improvements can and should be made to the marketing infrastructure in order to improve the flow and general operation and to improve waste disposal and protection of the produce from inclement weather. For example, better surfaces and better drainage, combined with regular cleaning of waste materials, would improve sanitation, as would more roofing, a good water supply, and hygienic toilet facilities. Better scales for weighing are also needed. Over time, supermarkets will become more important, and it is expected that they may drive improved quality, but for the moment they have not yet established any significant discrete supply chains direct to their retail outlets; they still heavily rely on the traditional marketing channels.

There are also only limited market opportunities for vegetables to be sold for processing. Due to lack of data, it is difficult to know accurately the tonnage of vegetables that are being processed in Bangladesh, because there are many small companies buying vegetables. The main market for processed products is the local market. The Bangladesh Agro-Processors Association (BAPA), which has 282 active members, claims that the value of exports by its members was about US\$371 million in FY2017/18, and that the main export items were spices (mainly chilies—18,000 MTs, worth US\$67 million) and a range of fruit drinks and juices. The majority of these exports are targeted at Bangladeshi communities in the Middle East and in regional markets, with smaller amounts going to Europe and the United States. Although the exports are small in overall terms, achieving export standards does eventually benefit some aspects of local markets for processed food. To put these market opportunities into perspective, it was calculated that 93 percent of the vegetables were sold in traditional marketing channels; 3–6 percent were processed; 1 percent were sold through supermarkets; and 1.6 percent were exported (table 4.1). Exports are declining, while sales to supermarkets and processors, and through traditional channels, are all expanding.

The existing limited scale of vegetable processing³ is almost entirely focused on the local market, with some regional sales across land borders to neighboring countries.⁴ It is estimated that 100,000–200,000 MTs per year of vegetables are processed, which is about 2.5 percent to 5.0 percent of total vegetable production. There is also a nascent food processing industry making potato crisps and, to a lesser extent, french fries. It is estimated that this uses about 60,000 MTs per year, and the output is sold in local markets. There are also

TABLE 4.1 Estimated size of different vegetable market segments

	METRIC TONS	PERCENTAGE	
		TOTAL PRODUCTION	COMMERCIALY TRADED
Total production	3,880,000	100	
Postfarm losses	776,000	20	
Commercially traded	3,104,000		
Exported	51,000		1.6
Processed	136,460		4.4
Supermarkets	31,060		1.0
Sold on the fresh market	2,885,480		93

Source: Sergeant and Graffham 2020.

some old factories that manufacture potato flakes for use in the preparation of starch, but these operate only in years when market prices are low, and they have very limited capacity.

Main lessons

The main observations from the assessment of the potato subsector of the vegetable market include the following:

- *Domestic market opportunities.* As discussed in chapter 2, the domestic demand for fruits and vegetables is growing with rising incomes and urbanization. An FAO estimate suggests that the daily per capita consumption in Bangladesh is 112 grams for vegetables and 14 grams for fruit (Bhattacharjee, Saha, and Nandi 2007), which is well below the World Health Organization (WHO) recommended diet of 400 grams per day. Therefore, the local fresh and processed food markets offer significant potential and should be the focus of support for the vegetable industry.
- *A limited number of formal off-takers in the fruit and vegetable value chains.* The food processing industry is still small, but indications are that it is growing as the buying power of local consumers increases.
- *An inadequate and ineffective export subsidy policy.* Vegetable and potato exports are very small and show no signs of increasing; in fact, potato exports are declining rapidly. Air freight exports have had a difficult time attaining the required food safety standards and being competitive. Currently, there is a 20 percent subsidy on the FOB value for exports, but this is not stimulating exports.
- *An inadequate marketing infrastructure.* The potato and vegetable marketing chains are very competitive, with many buyers competing with each other at each stage. Farmers and market intermediaries are in regular contact with each other to help establish market prices, which results in efficient transactions. However, it has been noted that the logistics and operations of the markets could be improved by investments in the marketing infrastructure.
- *The need for expansion of the capacity of logistical support services.* Private sector initiatives have driven much of the diversification of cropping, investments in processing and storage, and improved marketing and packaging. As the private sector invests further in processing and marketing, they not only provide secure markets for the farmers but can also be used to deliver extension messages and drive improved food safety and quality standards.
- *A need to improve the capacity for food safety and standards.* There is considerable interest among both public and private sector stakeholders in establishing improved standards and traceability of products; the private sector should be encouraged to take this process forward, with a focus on meeting domestic food safety and quality requirements.

FRUITS: MANGOES

Overview

Bangladesh grows a wide range of fruits, including mangoes, jackfruit, blackberries, pineapples, bananas, litchi, lemons, guava, custard apples, and many

PHOTO 4.2

A mango garden in Rangpur District

Source: © Andrew Graffham. Used with the permission of Andrew Graffham. Further permission required for reuse.

more (photo 4.2). Many of these fruits mature in the summer months of June, July, and August, and are very important for the nutrition of the population; they counterbalance many of the vegetables that are nutritionally important in the winter months.⁵ However, Bangladesh imports significant quantities of citrus fruits (mainly oranges and mandarins) and apples, mainly from China and South Africa.

Trade

Bangladesh is currently the eighth-largest mango producer in the world, but its exports of fresh mango are negligible and have declined from a peak of 800 MTs in 2016 to 100 MTs in 2019. The Khirshapati variety (popularly called Himsagar) is the most popular high-value variety, accounting for 25 percent of volume produced. The Gutti and Sahawina varieties are favored for processing, since there is lower demand for them on the fresh market. The domestic fresh market dominates and drives mango production; about 91 percent of Bangladesh's commercially traded output is sold on the fresh market. In 2019, the farm-gate price for fresh high-grade mango (the Khirshapati, Fozli, Lengra, and Gutti varieties) was US\$0.29–0.44 per kg (Tk 25–38 per kg) in Rajshahi. Rangpur also produces Hadivhanga, a high-value variety of mango with a later season (July–August);

the farm-gate price for mangoes in Rangpur in 2019 was US\$0.74–0.88 per kg (Tk 63–75 per kg).

Bangladesh has been much more successful in developing exports of processed mango products than of fresh produce. In 2018, Bangladeshi companies exported US\$12.3 million of processed mango products to 63 countries, and both the number of destinations and the value of processed product have increased since then. According to BAPA, the major destinations for processed mango products were India (64 percent), Saudi Arabia (13 percent), and Nepal (7 percent). Processed products have many advantages over fresh fruits, since they can be kept stable at ambient temperatures with a long shelf life. Also, the processing is carried out by large, well-resourced businesses that are able to maintain compliance with international standards for food safety, quality, packaging, and religious requirements.

Production and processing

Mango is a popular fruit that has emerging importance for processing, and there are some efforts to develop it for export. Mango output has been increasing by 4 percent per annum since 2010, and the amount of planted area has doubled since 2010 as some farmers have moved away from cultivating rice. Mango clusters are located mainly in the northern parts of the country; there is considerable trade in fresh mangoes sent to most other parts of the country, as well as a small but expanding processing market. In the 2018 season, mango was grown on 95,300 hectares, yielding 1,219,450 MTs of fruit, creating a national average yield of 12.7 MTs per hectare (BBS 2020). Even though the national average yields may be low, the yield potential for modern varieties such as Amropali is estimated at 20 MTs per hectare, if farmers follow good agronomic practices. However, production records for farms in the Rajshahi district indicate an average of only 5 MTs per hectare for trees that are 7 to 20 years old, and around 3 MTs per hectare for trees ranging from 50 to 100 years old;⁶ many of these orchards have been poorly managed, and have a low planting density. There are believed to be significant areas of older, less productive trees, although hard data are lacking. Orchard sizes are small, ranging from 0.5 to 3.0 hectares in size, and most mango farmers have not adopted good agricultural practices, lack knowledge of commercial production practices, and have limited managerial capacity. These factors are all responsible for the inability of farmers to get closer to the potential yield.

It is estimated that 9 percent of the country's mango crop, about 107,000 MTs, is used for processing. Processed mango products are increasingly popular in Bangladesh. According to BAPA, the purchase of mangoes for processing grew by 89 percent between 2012 and 2018. The biggest mango buyer for processing is PRAN, which purchased 76,900 MTs of mangoes for processing (valued at US\$16.2 million) in 2019. The other 30,100 MTs were bought by a range of smaller processors. In 2019 the farm-gate price (that is, the price paid to the farmer) ranged from US\$0.18 (Tk 15) per kg to US\$0.28 (Tk 24) per kg; these prices were lower than the prices paid for mangoes traded on the fresh market, because they were of lower quality than the less popular varieties.⁷ In 2018 the market for processed mango products (juice, drink, pickle, chutney, and fruit bars) was US\$28.6 million (excluding mango products made from imported concentrates). PRAN accounts for 65 percent of the market share, while Akij accounts for 20 percent; the remaining 15 percent is accounted for by numerous smaller processors.

Within Bangladesh, there is a growing concern among consumers that locally grown fresh fruits might contain pesticides, illegal ripening agents, and illegal preservatives such as formaldehyde. Before 2015, there was evidence of poor practices within the system, but government initiatives and improved regulation and enforcement have significantly reduced food safety risks. In June 2019, the Bangladesh Standards and Testing Institution tested 265 samples of mangoes and other seasonal fruits from wholesalers and dealers and found no evidence of the presence of formaldehyde, demonstrating how the government can contribute to improving food safety and quality along the food supply chain. Because of food safety concerns, however, some processing companies are now prohibiting the use of certain ripening products that are permitted by the Department of Agricultural Extension in the fruit that they procure—a good example of private-sector standards being higher than the government’s legal minimums.

Distribution and marketing

Fruit farmers have various options for marketing. They can sell in the local market, or direct to a bepari (trader), who will either buy it postharvest or while the fruit is still on the tree and have it harvested. Some beparis offer two- to three-year contracts to farmers. Mangoes intended for the domestic fresh markets are mostly sold in open markets in the main production areas and consolidated by traders who then move the fruit to major urban centers such as Dhaka, Chittagong, and Sylhet. The value chain for the domestic fresh and processing markets is well organized and efficient. Although many stakeholders complain of postharvest losses, there is little evidence to support this. One study reported losses for growers in the Rajshahi district of 3–4 percent, due mainly to poor harvesting techniques (Hassan 2010). Losses downstream from the farm were mainly due to unsuitable forms of transport, poor packaging, and storage facilities that lacked the means for controlling temperature and humidity. In 2010, postharvest losses were falling due to the rapid uptake of plastic crates, rather than woven baskets and jute sacks, for handling mangoes. By 2019, plastic crates had completely replaced traditional packaging for the postharvest handling of mangoes in the Rajshahi and Natore districts.

Beparis normally pay cash on receipt; deductions are made for rejects, sales commissions, and rental of storage space in order to arrive at the final price. The beparis have partners working in the main city markets to monitor commission sales by the wholesalers. The wholesalers charge an 8 percent commission on sales and usually pay within two days of sale via bKash, an electronic payment system using mobile phones.

Mango processors are encouraging improvement in GAPs among farmers. The largest buyer of mangoes for processing is PRAN, which tends to buy cheaper fruit (such as the less popular varieties) as well as lower-quality fruit (with skin blemishes or overripe but still suitable for pulp extraction). In the Rajshahi and Natore districts, PRAN employs 53 beparis; each one supports about 150 growers, who are subdivided into smaller groups of around 25. The bepari is paid a commission as well as a retainer. PRAN’s beparis have a wider role in the value chain as well, as they are expected to provide growers with advice on GAPs as well as company specifications concerning quality and safety requirements. When the fruit is delivered to the factory, all crates are labelled with the growers’ names as well as the weight for payment. In the event of a

quality or food safety problem, the fruit can be traced back to a group of 15–25 growers via a unique reference code. Corrective actions normally involve providing refresher training to the offending grower group, focused on the issue or issues that caused the problem.

Fresh mango is a seasonal product in Bangladesh, with the season running from April (for green mangoes) to May–August (for ripe fruit) each year. To make optimal use of processing facilities, companies such as PRAN require a year-round supply of mango pulp. This is achieved by buying an entire year's supply of fruit during the season. The fresh fruit is washed and then crushed to extract the pulp. The extracted pulp is heat-sterilized and then packed in food-grade drums under aseptic conditions. Drums of pulp are frozen and stored at -20°C in bulk freezers until they are needed for processing. The use of the pulping section has been extended by using the same extraction and thermal processing line for the pulping of tomatoes from December to February.

Bangladesh's mango production is being held back by its reliance on very old orchards with outdated varieties and unpruned trees. Replanting orchards is costly; farmers lose income for the first four or five years, until the trees start to produce the needed yields. Sergeant and Graffham (2020) estimated that the average cost for establishing a new orchard would be just over US\$1,000 per hectare; most of the expense is incurred in the first year, for the purchase of trees. However, a cost-benefit analysis shows that the net cost of establishment would be recovered in the first year that the orchard was in full production. In order to achieve these high margins, a high level of management, with good technical skills, is required. In order to encourage the modernization of tree crops, grants or loans with deferred repayment periods, and perhaps subsidized interest rates, could be given to farmers to compensate for lack of earnings in the first few years.

Main lessons learned

The main observations from the mango value chain are the following:

- *Adequate access to local markets but a limited international market.* The production and processing of mangoes are expanding, with the majority of sales going to the domestic market. Despite considerable donor support, Bangladesh has had very little success in exporting fresh mangoes, especially when compared to India and Pakistan. There is some potential for further growth of the export market for processed products, but this opportunity will be small compared with the local fresh market.
- *Land fragmentation and low yields.* Production is characterized by small farm sizes with relatively low yields that are well below commercial expectations.
- *Limited adoption of good agricultural practices.* The main reasons for low yields appear to be the old age of the trees and lack of knowledge of and application of good agricultural practices; in fact, the management of many of the orchards assessed was very poor. There are significant areas of old trees (more than 40 years old) that give poor yields and are too large for implementation of proper pruning and crop protection strategies.
- *Access to improved genetic materials.* The sector would benefit from replanting with new trees, growing larger orchards, and adopting good agricultural practices. The mango industry would also benefit if farmers were better

informed about improved production and management techniques. Improved information transfer techniques are required in order to get information on better practices down to the farm level.

- *Inadequate fertilizer and pesticides policies.* There is a perception that there is excessive use of pesticides on mangoes. This could be due to increased testing of mangoes, but undoubtedly there is also a poor understanding of what farmers are spraying against; some of the insects on the trees are in fact beneficial and should be encouraged.

NOTES

1. Salam and Kamruzzaman (2016) noted that “Although the cultivation of soybeans was found to be profitable, many farmers showed negative attitudes toward its production.” Among the reasons for this was “lack of HYV [high-yielding varieties] seed availability, lack of technical knowledge, and natural calamities.”
2. In 2018, data from the Food and Agriculture Organization (FAO) of the United Nations gave the average potato yield in Bangladesh as 20.4 tons per hectare (ha); in India (with similar length of days and climate) as 22.6 tons per ha; in the UK as 35.9 tons per ha; in Australia as 40.0 tons per ha; and in the United States as 49.8 tons per ha. See the Our World in Data database, <https://ourworldindata.org/grapher/potato-yields>.
3. Some of the 282 active BAPA members are buying vegetables.
4. Mainly in Bhutan, India, and Nepal.
5. See “Fruit,” 2015, in Banglapedia, <http://en.banglapedia.org/index.php?title=Fruit>.
6. Based on key informant interviews.
7. Often farmers take the best fruit and sell it into the fresh market and keep the lesser-quality, damaged, and smaller fruit for selling to processors.

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5 Moving Forward

PRIORITY AREAS OF ACTION

SUMMARY OF THE KEY CHALLENGES

The analysis and discussion in chapter 2 highlighted market opportunities and the potential for productive diversification of the agrifood sector in Bangladesh. With the country's rising incomes, increasing urbanization, and changing diets, the demand for high-value food products is gradually growing; this opens new market opportunities for a more diversified agrifood sector. The agroclimatic conditions and production systems required for agricultural diversification do exist in the country. However, the current situation of staple-focused agricultural policies and support is not well positioned to unlock the potential for diversification within the sector. The current level of direct support for agriculture in Bangladesh through public expenditures, as well as indirect support through policies, is substantial, but the bulk of this support is delivered in a manner that emphasizes paddy rice production and incentivizes the overuse of resources. Moreover, modernization of the agrifood value chain, which is currently largely informal, is important in order to realize the untapped potential for increased diversification of the sector. Therefore, realigning agricultural policies and support is important in order to promote productive diversification and modernization of the sector.

Chapters 3 and 4 identify the constraints and challenges for increased diversification and modernization of the sector across the agrifood ecosystem under broad categories: (1) on-farm productivity constraints, (2) off-farm value addition and commercialization constraints, and (3) cross-sectoral enablers. The major productivity constraints, which have been identified and discussed in preceding chapters, include land fragmentation and informality in land rental markets; limited access to quality seeds for nonpaddy crops; limited knowledge and adoption of good agronomic practices (GAPs), reflected in imbalanced use and overuse of inputs; and limited use of farmers' aggregation models, a practice that is constraining the delivery of extension services, access to financing, and linking with markets. Similarly, some of the key constraints preventing off-farm value addition and commercialization in the agrifood sector have been identified and discussed. Such constraints include a limited number of formal off-takers, an inadequate and costly marketing infrastructure and logistical services, inadequate

upholding of appropriate food safety practices and product quality standards, and poorly designed export subsidy policies. These constraints are exacerbated by other cross-sectoral issues, such as access to finance, and some overall investment climate and competitiveness challenges.

The next section of this chapter provides a discussion of recommendations increasing private investment along the agrifood value chain and promoting greater diversification and modernization of the agrifood sector in Bangladesh.

PROPOSED AREAS OF ACTION

Recommendations for greater on-farm productivity

Support greater land agglomeration and promote greater formalization of land rental markets with longer rental tenures. For modernization to be successful, it is essential that Bangladeshi agriculture achieve economies of scale. However, land fragmentation is limiting its potential for such; a well-functioning land market, including land rental markets, can help to circumvent this challenge. While the sales market is functioning well, and property rights are clearly defined, the land rental market remains largely informal, and land leasing agreements are short term in nature. This prevents medium- and long-term investments in the land by the farmers who are renting it, since the short tenure gives them very little security. It also constrains the ability of farmers to use land as collateral for financing. Therefore, further review of the agricultural land rental market is important in order to identify current market failures that are preventing more prevalent longer-term rentals of agricultural land, and to offer private solutions, if possible, to correct these market failures.

Encourage and promote aggregation models to bring economies of scale to operations. Aggregation models such as productive partnerships, contract farming, and producer groups, among others, need to be encouraged in order to facilitate the delivery of extension services and improve farmers' ability to access financing, develop joint infrastructures, lower marketing and logistics costs, and better connect with large buyers and off-takers. While public extension services can encourage and promote such models for more efficient inputs and service delivery to farmers, the private sector can also lead the organization of such models in order to improve good agricultural practices, traceability, and economies of scale, among other things. An assessment needs to be done in close collaboration with the private sector in order to determine some of the essential parameters for greater uptake of aggregation models, in line with the maximizing finance for development (MFD) framework. Supporting the development of online platforms by the private sector to enable connecting producers with off-takers, or directly with consumers, would also contribute to overcoming marketing challenges.

Remove regulatory barriers to private sector participation in the seed market and increase the use of quality standards for seeds. There is a need to remove the regulation preventing private sector actors from breeding and producing seeds for notified crops. There is also a need to increase public-private coordination on developing a supply of quality seeds for notified crops and to increase market transparency regarding the quality and effectiveness of seeds in the market, as a way to drive greater demand for improved genetic materials from farmers. This should in turn encourage the private sector to invest in this field. Such a regulatory change, and the accompanying

improvement in the seed markets, would ideally be developed in close partnership between the public sector and seed producers, importers, and distributors from the private sector in order to ensure targeted market outcomes—again in line with the MFD framework.

Develop and adopt good agricultural practices. With public and private entities working together, local GAP standards should be developed and adopted in order to address the misuse and overuse of certain inputs like fertilizer and pesticides, along with other food safety concerns. Subsequently, GAP should be the key area of focus for the delivery of extension services to farmers through both public and private entities.

Improve access to extension advice through innovation and the use of digital technologies. Improvements to current extension services are needed in order to get information on new techniques and innovations down to the farm level in a usable form. In particular, improved support for Department of Agricultural Extension staff with regard to updating agricultural knowledge, the training curriculum, techniques for training, and the use of new technologies is required. The introduction of information and communication technologies for the delivery of extension services is critical in order to overcome limited resources and to reach most farmers, particularly hard-to-reach farmers in remote areas. This calls for partnerships with private sector actors to enable digital solutions. More public-private collaboration is also needed in order to maximize efficiency in the use of available resources, including support to the private operators who routinely provide extension advice to farmers—for example, input suppliers—but who also need to be trained themselves. Increasing public-private coordination in the provision of extension advice would also help to facilitate more rapid dissemination and demonstration of the innovations and technologies that are being developed by the national agricultural research system.

Realign and repurpose the fertilizer subsidy policy. As mentioned throughout this report, the current fertilizer subsidy policy appears to be leading to overuse and unbalanced use of fertilizers, and the policy is also very costly. This presents an opportunity to redirect this support to other public-good activities that could be more effective in increasing productivity for paddy rice as well as other crops in a more sustainable way. To rationalize the current fertilizer subsidy in terms of the long-term sustainability of the agriculture sector, a phased approach can be followed to reform the subsidy policy and increase direct support to farmers; this could improve the efficiency of the public support for agriculture and incentivize farmers to make market-driven production decisions. As a part of the rationalization process, a pilot project on an e-voucher system for inputs could be considered to shift production to nonpaddy crops, with broader scale adoption being dependent on pilot results.

Recommendations for greater off-farm value addition and better commercialization of food products

Improve marketing infrastructure and logistical services. As discussed in the section “Performance and Key Challenges of the Business Climate” of chapter 3, the marketing and logistics infrastructure and services are both poor and inadequate in Bangladesh, resulting in higher costs for actors all along the agrifood value chain. The development of a better marketing infrastructure and more effective logistical services for agricultural supply chains should be led by the private sector, while the government could implement policies to support

private businesses that are interested in taking advantage of business opportunities to develop the marketing infrastructure. A public-private partnership framework for the agricultural marketing infrastructure—for example, the development of regional market hubs, cold storage, warehouses, and cool chains, including a railway cool chain—would give the private sector greater policy certainty on government support for the development of the marketing infrastructure.

Adoption of a regulatory framework for vehicles—and drivers who are engaged in the transportation of agricultural commodities—is important in order to reduce current bad practices, such as overloading vehicles. This framework should also seek to reduce unnecessary roadblocks and other logistical impediments to the transportation of food.

Develop reliable access to energy. Access to reliable and cost-competitive sources of energy is needed for food processing and cold chain operations along the value chain (for example, for potato seeds). Promoting renewable energy (for example, solar), along with energy-efficient, climate-smart agricultural technologies, and other public and private sector efforts to improve access to energy in the country, could contribute to a modernized and sustainable agrifood sector.

Improve the regulatory and oversight system for food safety and support the adoption of appropriate food safety practices by the private sector. Food safety challenges have greatly penalized Bangladesh’s food markets. Despite efforts to address these issues, compliance monitoring and law enforcement remain weak and irregular. The complexity and overlaps in both the legal and regulatory framework, with its confusing array of many acts, laws, and regulations, and the control and enforcement system, with many ministries and agencies in charge of various aspects of the framework, are preventing significant improvement in food safety outcomes. Substantial efforts to streamline the legal and regulatory framework for food safety, as well as to improve the control and enforcement system, appear needed, ideally in close coordination with the private sector.

Private actors along the agrifood value chain will also need support in order to comply with food safety rules, once they are clarified.

Promote improved quality standards. There is a need to support the private sector in developing industry wide, harmonized commercial standards that comply with the minimum legal food safety requirements, both for primary production and for food processing. Such a private sector–led approach has proved successful in other parts of the world, for example, the UK Red Tractor and the British Retail Consortium food standards. Success would be derived from the public sector supporting the harmonization process and from the public and private sectors working together to ensure close links and coordination of regulatory requirements and private standards. The definition of domestic product standards need to be tailored to domestic market conditions to ensure that consumers are protected, while also ensuring that value-chain actors will be able to eventually comply. Different, more stringent standards will probably be needed for exportation.

Promote more formal distribution channels. To promote the development of more formal off-takers, such as food processors and supermarkets, the public sector could encourage increased demand for higher quality and safer food through consumer awareness and sensitization campaigns. Better enforcement of food safety standards would also encourage more formal distribution

channels and/or encourage informal channels to formalize. Addressing access to finance issues for agribusinesses and aggregation challenges, along with improvements in the quality and cost of energy and of the marketing and logistics infrastructure and services, would also help to expand the food-processing industry.

Repurpose the export subsidy policy. The current export subsidy provision—20 percent of free-on-board value—does not appear to have led to sustainable competitiveness of horticultural exports. As such, a more in-depth cost-benefit assessment is needed in order to see how the subsidy could be modified and/or repurposed, especially to help address preexport competitiveness challenges.

Promote public-private dialogue platforms by subsector. The implementation of most of these recommendations will require close coordination between the public and the private sectors. Platforms and other systems of coordination between private sector actors (such as industry associations and interprofessional bodies) and between the public and private sectors will need to be supported in order to ensure this much-needed collaborative work toward unlocking some of the sector’s key constraints.

Recommendations for other cross-sectoral issues

Facilitate access to finance for value-chain actors. Access to finance, particularly access to formal credit, remains a key challenge for agribusinesses and farmers in Bangladesh. Possible interventions to improve access to finance for agrifood value-chain actors are wide ranging, from the opportunity to further develop innovative tools like warehouse receipt financing for postharvest financing to addressing broader issues such as strengthening the secured transactions regime or supporting the use of rental land as collateral. Detailed solutions have been proposed by a recent World Bank report, “Financing Solutions for Micro, Small, and Medium Enterprises in Bangladesh,” for instance. For most of the proposed solution areas, coordination among key stakeholders, most notably value-chain actors and financial institutions, would be needed in order to implement actionable solutions.

Address broader investment climate and competitiveness challenges. As shown in the country’s performance, according to the Ease of Doing Business and the Global Competitiveness Indexes, improvements are needed in Bangladesh’s overall investment climate. These challenges are limiting the inflow of foreign direct investments, which would greatly benefit the agrifood sector in terms of knowledge transfers, the structuring of domestic value chains, and the ability to target and meet export market requirements.

APPENDIX A

TABLE A.1 Pattern of crop diversification in Bangladesh and across divisions, 2014–18

GEOGRAPHIC UNIT	SIMPSON'S DIVERSITY INDEX, 2014	SHARE OF LAND UNDER RICE CULTIVATION, 2014	SIMPSON'S DIVERSITY INDEX, 2018	SHARE OF LAND UNDER RICE CULTIVATION, 2018
Bangladesh	0.43	0.75	0.46	0.73
Barisal Division	0.23	0.88	0.34	0.81
Chattogram Division	0.31	0.83	0.37	0.79
Dhaka Division	0.56	0.65	0.62	0.60
Khulna Division	0.50	0.69	0.53	0.67
Mymensingh Division	0.21	0.89	0.24	0.87
Rajshahi Division	0.55	0.66	0.58	0.64
Rangpur Division	0.46	0.73	0.48	0.71
Sylhet Division	0.16	0.92	0.18	0.90

Source: Bangladesh Bureau of Statistics (BBS). 2014 and 2018. *Yearbook of Agricultural Statistics*, 2014 and 2018. Dhaka: BBS.

TABLE A.2 Commodity balance, 2000–17*Metric tons, thousands*

	2000	2005	2010	2013	2017
Cereals					
Domestic supply quantity	28,620	31,168	34,399	35,891	—
Export quantity	1	7	12	14	—
Import quantity	2,483	2,953	4,606	3,606	—
Fruits					
Domestic supply quantity	1,476	3,081	4,248	4,021	4,845
Export quantity	0	11	14	26	57
Import quantity	116	90	355	348	403
Oil crops					
Domestic supply quantity	1,144	803	907	706	1,051
Export quantity	6	5	18	29	10
Import quantity	736	385	447	185	1,023
Pulses					
Domestic supply quantity	561	663	1,005	1,072	1,230
Export quantity	0	0	0	0	0
Import quantity	178	347	785	804	848
Spices					
Domestic supply quantity	257	357	396	430	499
Export quantity	0	1	2	3	2
Import quantity	30	37	86	114	106
Vegetable oil					
Domestic supply quantity	1,109	1,276	1,618	1,818	2,145
Export quantity	0	3	2	2	4
Import quantity	1,114	1,215	1,337	1,672	2,383
Vegetables					
Domestic supply quantity	1,835	2,635	4,265	4,654	6,082
Export quantity	7	31	8	8	16
Import quantity	40	99	584	471	274
Fish					
Domestic supply quantity	1,623	2,158	3,002	3,063	3,951
Export quantity	41	64	103	107	78
Import quantity	3	7	70	45	150
Milk					
Domestic supply quantity	2,451	3,167	3,985	4,283	3,585
Export quantity	0	1	0	0	0
Import quantity	314	552	587	752	3

Source: FAO (Food and Agriculture Organization of the United Nations). 2020. FAOSTAT Statistical Database. Rome: FAO.

Note: — = not available.

TABLE A.3 Regression results: Correlates for crop diversification in Bangladesh

VARIABLES	NUMBER OF CROP CATEGORIES GROWN	STANDARD ERROR	SIMPSON'S CROP DIVERSITY INDEX	STANDARD ERROR
Age of head of household (HH)	0.001	[0.001]	0.0	[0.000]
Marital status: Currently married (base: never married)	0.052	[0.055]	0.030**	[0.014]
Marital status: Divorced/widowed (base: never married)	0.072	[0.078]	0.027	[0.020]
Head is male	0.162***	[0.045]	0.037***	[0.011]
Number of adult males in HH (age 15 to 60)	0.029**	[0.012]	0.0	[0.003]
Number of adult females in HH (age 15 to 60)	0.006	[0.016]	0.004	[0.004]
Household size	0.019**	[0.008]	0.003	[0.002]
Education: Primary (base is no schooling)	0.029	[0.119]	0.019	[0.026]
Education: High school (base is no schooling)	0.032	[0.120]	0.017	[0.026]
Education: Secondary and above (base is no schooling)	-0.025	[0.121]	0.01	[0.026]
Live in own house	0.066*	[0.036]	-0.001	[0.010]
Own livestock	0.03	[0.028]	-0.020***	[0.006]
Have foreign remittance income	0.109***	[0.041]	0.002	[0.009]
Receive social transfer	0.038	[0.027]	0.006	[0.007]
Have labor income from nonfarm activity	-0.156***	[0.033]	-0.024***	[0.008]
Primary labor market income source is nonagricultural activity	-0.118***	[0.034]	-0.023***	[0.009]
Have income from nonfarm enterprise	0.021	[0.025]	-0.001	[0.006]
Nonagricultural asset score (based on PCA)	-0.011	[0.008]	-0.004*	[0.002]
Agricultural asset score (based on PCA)	0.084***	[0.008]	0.011***	[0.001]
Total cultivated land	0.002**	[0.001]	-0.001***	[0.000]
Sell agricultural produce in the market	0.290***	[0.030]	0.071***	[0.007]
Have access to and utilize irrigation	0.032	[0.034]	0.004	[0.008]
Access to machine rental market	0.199***	[0.036]	0.016*	[0.009]
Utilized hired labor	0.269***	[0.027]	0.044***	[0.006]
Transport usage for carrying produce	0.321***	[0.029]	0.045***	[0.006]
Subscribed to agricultural loan or insurance	0.334***	[0.082]	0.055**	[0.022]
Constant	0.919***	[0.178]	0.076*	[0.039]
District fixed effect	Yes		Yes	
Number of observations	14,086		14,086	
Adjusted R-square	0.311		0.277	
F stats	30.86	0.00	19.9	0.00

Source: World Bank.

Note: Two other variables (roof materials and types of toilet) were used as control variables, but results were not significant and are therefore not reported. HH = household; PCA = principal component analysis. Standard errors are in brackets. All standard errors are clustered at the primary sampling unit level. Bold coefficients are statistically significant.

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

TABLE A.4 Yield advantage and revealed comparative advantage of Bangladeshi agricultural commodities

BANGLADESH YIELD/WORLD AVERAGE YIELD			REVEALED COMPARATIVE ADVANTAGE		
1	Coconuts	1.67	1	Jute	487.96
2	Spices	1.63	2	Rapeseed	10.52
3	Mangoes	1.61	3	Garlic	10.52
4	Sesame	1.55	4	Sesame	4.82
5	Cotton	1.49	5	Cotton	2.34
6	Maize	1.26	6	Fish	2.18
7	Ginger	1.10	7	Spices	1.54
8	Rice	1.00	8	Tobacco	1.26
9	Chickpeas	0.98	9	Spinach	1.04
10	Potatoes	0.97	10	Papayas	0.93
11	Tobacco	0.96	11	Potatoes	0.75
12	Lentils	0.92	12	Chilies and peppers, dry	0.71
13	Wheat	0.91	13	Cabbages and brassicas	0.37
14	Jute	0.89	14	Rubber	0.28
15	Melons	0.88	15	Beans	0.28
16	Sweet potatoes	0.86	16	Rice	0.25
17	Millet	0.84	17	Mangoes	0.20
18	Beans	0.84	18	Grapes	0.19
19	Bananas	0.77	19	Tea	0.17
20	Linseed	0.74	20	Pineapples	0.07
21	Tea	0.74	21	Ginger	0.06
22	Grapes	0.70	22	Cucumbers and gherkins	0.05
23	Soybeans	0.67	23	Lemons and limes	0.05
24	Cauliflower and broccoli	0.63	24	Soybeans	0.04
25	Peas	0.58	25	Cauliflower and broccoli	0.04
26	Chilies and peppers, dry	0.58	26	Millet	0.03
27	Pineapples	0.56	27	Linseed	0.03
28	Rapeseed	0.52	28	Grapefruit	0.02
29	Onions	0.50	29	Milk	0.02
30	Cabbages and brassicas	0.47	30	Bananas	0.02

Source: Based on FAO. 2020. FAOSTAT Statistical Database. Rome: FAO.

ECO-AUDIT

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Agriculture plays a central role in Bangladesh's economy, especially in rural areas, and further progress in agriculture will remain important as Bangladesh's economy continues to evolve. Bangladesh has made significant agricultural policy reforms since the 1980s, which has largely contributed to achieving self-sufficiency in rice production. However, these policies are now creating headwinds, constraining the emergence of a more diversified production system. With rapid urbanization and income growth, dietary patterns are changing in Bangladesh and new market opportunities are emerging for diverse, safe, and nutritious foods. Thus, additional productive diversification in agriculture and modernization along the agri-food value chain are needed in order to allow the sector to seize the emerging domestic market opportunities.

Promoting greater diversification and modernization of the agri-food sector in Bangladesh will require repurposing the country's agricultural support along with increasing private investment, both along the agri-food value chain and in support services to that chain. The agri-food ecosystem analysis in the report has identified critical constraints to the diversification and modernization of the agri-food sector. The major productivity constraints include land fragmentation and informality in the land rental markets; limited access to quality seeds for nonpaddy crops; limited knowledge of and adoption of good agricultural practices, reflected in unbalanced use and overuse of inputs; and limited use of farmer aggregation models, which constrains the delivery of extension services, access to financing, and linking with markets. Other key constraints, which are preventing off-farm value addition and commercialization in the sector, include the limited number of formal off-takers; inadequate and costly marketing infrastructure and logistic services; inadequate upholding of appropriate food safety practices and product quality standards; and a poorly designed export subsidy policy. These constraints are exacerbated by other cross-sectoral issues, such as access to finance, and the overall challenges of the investment climate and competitiveness.