



Foresight4Food
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Background Brief

Fostering Nutritious Diets: Pathways To Greater Fruit And Vegetable Intake



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Key messages

01

Bangladesh's fruit and vegetable production has been increasing steadily, showing potential for further growth. However, while the per capita consumption of fruits and vegetables is improving, it still falls short of the recommended dietary levels, indicating a need for greater consumer awareness.

02

The diversity and seasonal variation in Bangladesh's fruit and vegetable sector provides a strong foundation for expanding both domestic consumption and export potential. This includes sustainable production and consumption of existing fruit and vegetables focusing the maximization of yields and introducing climate-resilient varieties to mitigate environmental challenges.

03

Opportunities for sector growth include developing new climate-resilient crop varieties, increasing value addition in the supply chain, promoting local entrepreneurs, and improving access to international markets.

04

The sector faces significant barriers, such as weak market infrastructure, excessive pesticide use, inadequate storage facilities, dependency on imported seeds, price volatility, and poor access to international markets. These issues limit the sector's potential and create instability for both farmers and consumers.

05

The fruit and vegetable sector is vulnerable to uncertainties like climate change, extreme weather events, pest infestations, and international market fluctuations, and addressing these requires a multi-stakeholder approach.

06

Policy efforts should focus on promoting climate-resilient agricultural practices, reducing post-harvest losses, strengthening market channels, enhancing food safety standards, and improving consumer awareness around the health benefits of fruits and vegetables.

07

Engaging with key stakeholders – including farmers, government agencies, private sector actors, and consumers – is essential to foster innovation, support value chain development, and ensure the long-term sustainability of Bangladesh's fruit and vegetable sector.

Introduction

This paper highlights the role of sustainable fruit and vegetable production in promoting healthier diets in Bangladesh. An overview of the key trends in fruit & vegetable production and consumption are provided with detail on associated opportunities and barriers. The authors identify critical uncertainties, construct future scenarios and explore their implications for key players in the sector. Based on these results, policy recommendations are formulated to support the sustainable production of fruit and vegetables for healthier diets in Bangladesh.

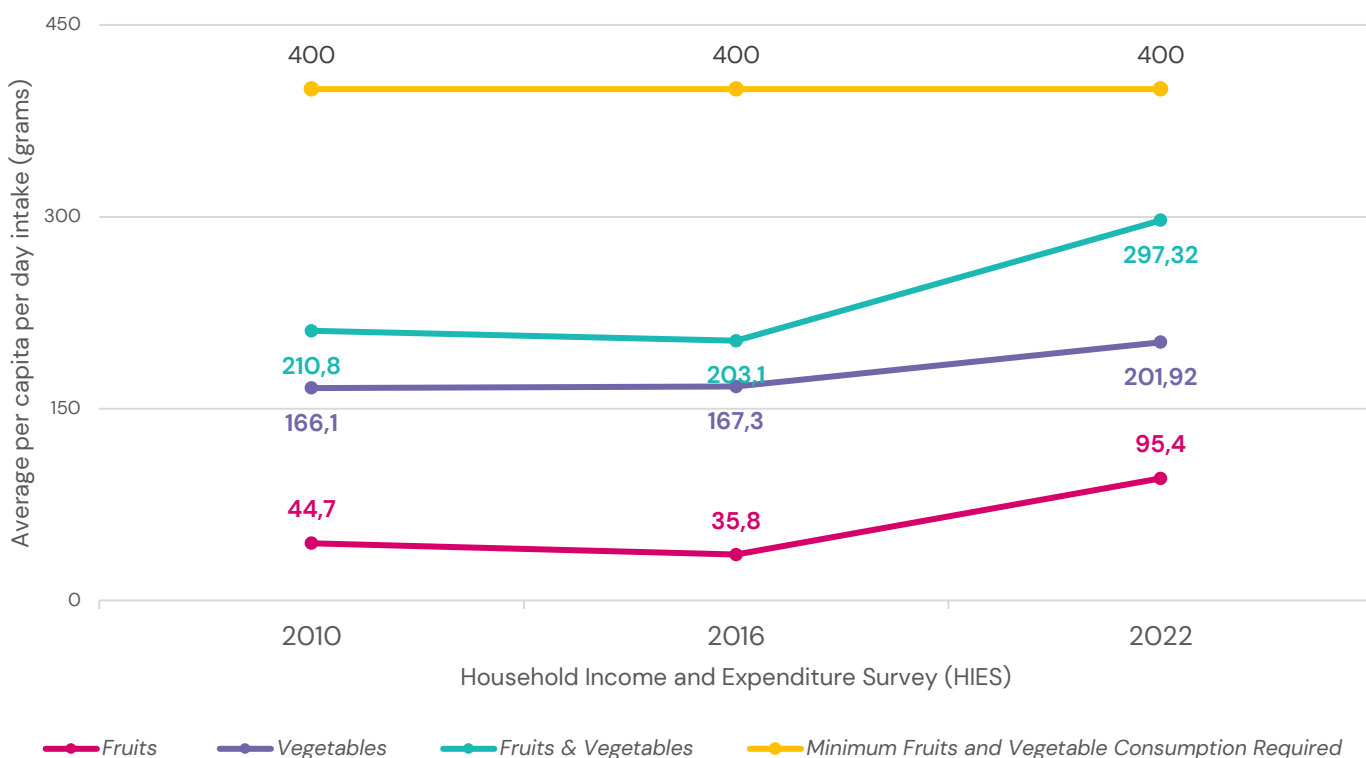


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Key trends in the production and consumption of fruits and vegetables in Bangladesh

Fruits and vegetables are vital for human health, providing essential nutrients like vitamins, minerals, fiber, and antioxidants. While the World Health Organization (WHO) recommends a daily intake of 400 grams of fruits and vegetables (WHO, 2023), consumption in Bangladesh continues to fall below this standard. The Household Income and Expenditure Survey (2022) reveals that per capita intake per day is 95.4 grams for fruit and 201.9 grams for vegetables (Figure 1).

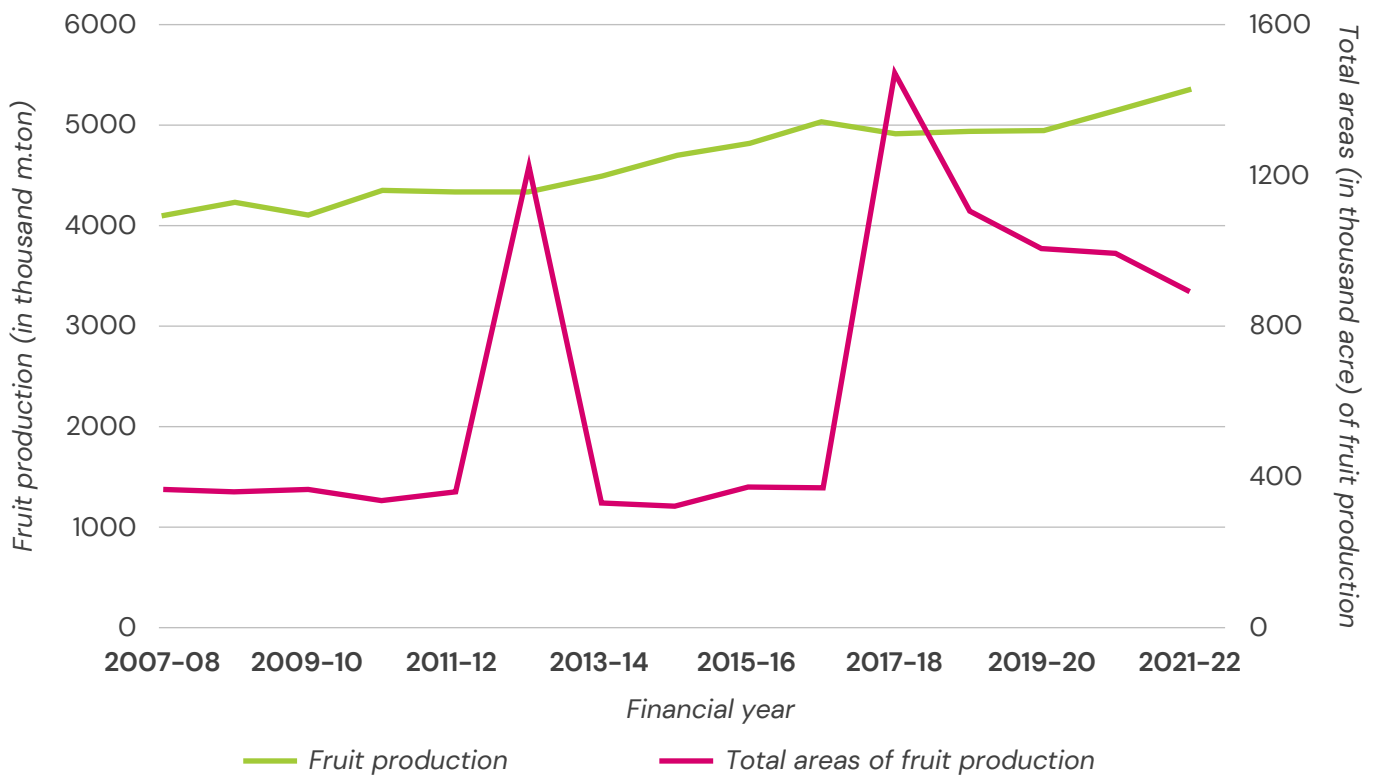
Figure 1: Average per capita per day fruit and vegetable intake (in grams)



Bangladesh's fruit and vegetable sector is fast evolving, driven by the introduction of new varieties and increasing awareness of the health benefits of a diverse diet. Fruit production in Bangladesh has expanded significantly in recent years, peaking at over 5.3 million metric tons in 2017-18. The country boasts over 70 fruit species, with major crops including mango, jackfruit, pineapple, banana, litchi, and guava; and the country ranks among the top 10 global producers of mango, jackfruit, and guava (Rashid et al., 2023).

Despite increasing fruit production, the land area under fruit cultivation has fluctuated, peaking in 2017–18 before declining in recent years (Figure 2). As such, Bangladesh currently only meets 40% of its fruit demand locally, causing imports to rise 6% annually, especially during the off-season (September to January). Significant amounts of fruit, primarily apples and oranges, are imported from China and India.

Figure 2: Area and production of fruit in Bangladesh



Bangladesh is the world’s third-largest vegetable producer (FAO, 2022), with production reaching 19 million tons in 2020–21. Almost 2.6% of its land is dedicated to growing over 100 types of vegetables (Haque and Hoque, 2021) – including potatoes, tomatoes, cucumbers, and leafy greens – and nearly four million people, including many women, are engaged in vegetable cultivation. The country’s favorable climate and fertile land offer ideal conditions for both summer and winter crops. The production of summer vegetables has shown a steady upward trend, even though the cultivated area initially decreased (Figure 3), and winter vegetable production has grown consistently, with both area and yield increasing steadily (Figure 4).

Although Bangladesh is a net exporter of vegetables, it faces challenges such as post-harvest losses, inadequate storage, poor infrastructure, and lenient quality standards (Jahan, 2023).



Image credit: IFAD/ Fahad Kaizer

Figure 3: Area and production of summer vegetables

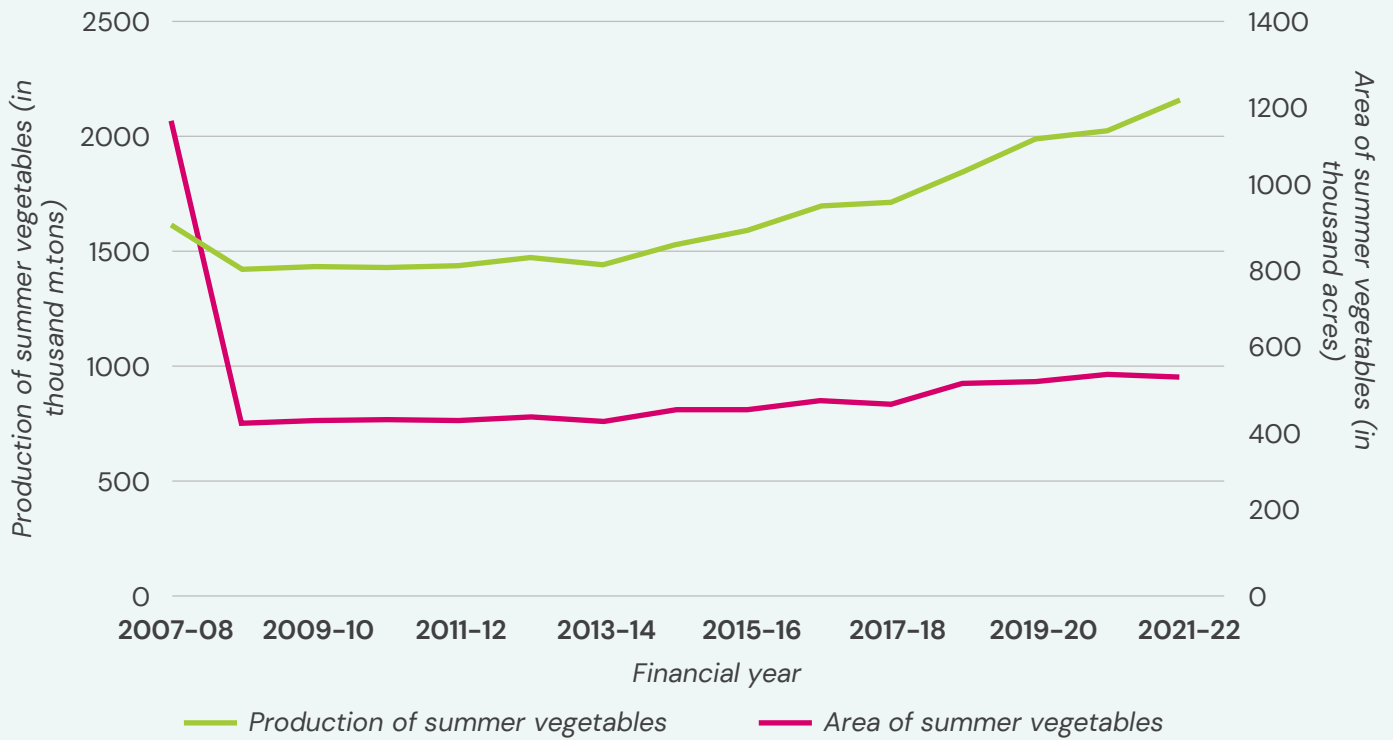
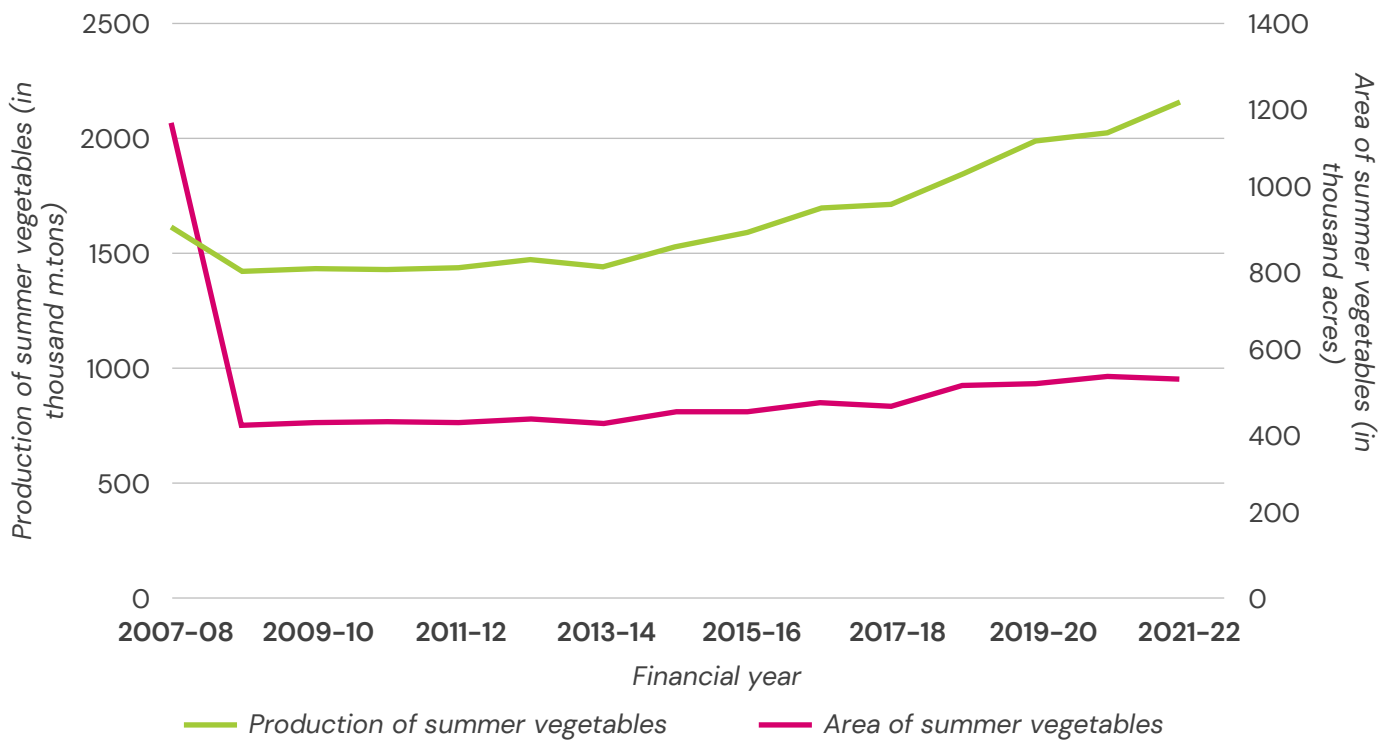


Figure 4: Area and production of winter vegetables



The country’s fruit and vegetable sectors hold strong potential for sustained growth. To achieve this, however, it is essential to address the key challenges and factors affecting productivity and the external conditions influencing cultivation. Bangladesh’s significant role in regional food security could also be enhanced through continued investment and innovation, improving both export potential and public health.

Opportunities and barriers in fruit and vegetable production and consumption

Production opportunities



Climate-resilient varieties: There is significant potential to develop and adopt climate-resilient fruits and vegetables. These varieties can reduce the need for water and pesticides, stabilize farmer incomes, and create new markets both domestically and internationally (Hasan et al., 2018).



Improved processes: Enhancing distribution strategies and focusing on value-added products can reduce post-harvest losses, increase shelf life, meet off-season demands, and enhance market stability (Jia et al., 2023).



Local entrepreneurship: Local entrepreneurs involved in commercial orchard and vegetable farming have the potential to meet growing demand by producing fresh fruits and vegetables (Haque and Hoque, 2021), provide rural employment, reduce urban migration, and contribute to local economic development (Arumugam & Manida, 2023).



High-value crops and price incentives: The rising demand for high-value fruits and vegetables creates incentives for farmers to innovate and adopt better techniques (Fuetsch, 2022; Leavy & Hossain, 2014). Potential higher prices may also encourage entrepreneurs to invest in post-harvest infrastructure, such as storage and transportation (Anand & Barua, 2022; Ridolfi et al., 2018).



Export potentials: Bangladesh has significant export potential for fruits and vegetables. Expansion into international markets can diversify incomes, increase foreign exchange earnings, and encourage adoption of advanced farming and quality standards (The Financial Express, 2024; Ahmed et al., 2021).

Production barriers



Weak market channels and price fluctuations: Weak market infrastructure and unpredictable price fluctuations limit farmers' access to fair pricing and make it difficult for them to invest in production (Kuijpers, 2020; Sarma & Ali, 2018; Jahan, 2023), leading to supply chain delays and losses.



Inadequate storage facilities and post-harvest losses: Bangladesh's hot and humid climate, combined with a lack of proper storage facilities, leads to rapid spoilage, forcing farmers to sell produce immediately at lower prices. This affects the quality and competitiveness of the sector (Jahan, 2023).



Excessive pesticide use: Over-reliance on chemical pesticides increases growing costs, degrades the environment, and poses health risks – together hindering the sector's ability to develop resiliently (Farouque et al., 2024).



Lack of awareness of quality standards: Many farmers and post-harvest handlers lack knowledge of best practices and quality standards of produce leading to substandard products, limited export opportunities, and higher post-harvest losses (Akter et al., 2018; Hoque, 2012).



Limited access to international markets: Without access to global markets, farmers are confined to local sales. This limits their incentive to invest in high-quality practices (Quddus & Kropp, 2020) and reduces export potential.



Dependence on imported seeds: Reliance on imported seeds increases costs, creates supply chain vulnerabilities, and limits the development of local seed industries (Shahrial, 2018), often resulting in suboptimal yields and increased susceptibility to pests and diseases (Kumar et al., 2021).

Consumption opportunities



Enhanced diversity: Increased consumer awareness on the health benefits of fruits and vegetables, rising urbanization, and media influence has led to a greater diet diversity (Akter et al., 2023; Mustafa, 2022; Islam et al., 2023; Pamuk et al., 2021), which supports biodiversity and agricultural resilience.



Growing consumer purchasing power: Economic growth has improved consumers' purchasing power, allowing them to opt for organic and premium quality produce, and consequently boosting farmer income and market demand (Alan et al., 2020; Mustafa et al., 2022).



Recognize consumer needs: Addressing consumers' nutritional needs, particularly those of low-income groups (by introducing different social welfare programmes), can help further increase domestic fruit and vegetable consumption.



Expansion of retail outlets: Supermarkets and specialized produce stores have increased in number, offering consumers greater access to a wider variety of fruits and vegetables.



Seasonal variation: The wide variety of fruits and vegetables available across the seasons ensures a continuous supply of diverse nutrients that promotes incorporation of different food groups into their diet and enhances nutritional balance and diet diversity (Pamuk et al., 2021).



Improved grading and packaging practices: Proper grading and packaging increases consumer confidence in the quality of produce (Amfo & Ali, 2021), extends shelf life, and reduces waste, contributing to better consumption and distribution practices (Gordon & Williams, 2020; Gema et al., 2020).

Consumption barriers



Adulteration and safety concerns: The use of harmful chemicals and artificial ripening agents in food products leads to consumer distrust and hinders consumption (Hoque et al., 2022; Parveen et al., 2023).



Cultural desirability and taboos: Some fruits and vegetables are viewed as less desirable due to cultural and social beliefs, which limits their consumption (Mustafa et al., 2021).



Lack of nutritional awareness: Poor understanding among consumers of the nutritional benefits of fruits and vegetables means many do not see the value in diversifying their diet to include these foods, which can result in poor health outcomes.



High prices: The higher cost of fruits and vegetables – driven by inadequate infrastructure and distribution networks – make them less affordable for lower-income households, who prioritize staple foods (Pamuk et al., 2021).



Competition with processed foods: Aggressive marketing of processed and unhealthy foods can overshadow the importance of fresh produce (Kaur, 2023), limiting fruit and vegetable consumption.



Waste and poor shelf life: Inefficient supply chains and inadequate household storage lead to spoilage and reduced availability, negatively impacting consumer access to fresh produce (Joardder et al., 2020; Kaur, 2023).



Image credit: IFAD/GMB Akash

Key uncertainties in the future of the fruit and vegetable sector



Climate change impacts: Rising temperatures, erratic rainfall, droughts, and saline water intrusion are already affecting six hot-spot regions in Bangladesh, disrupting crop production and quality. Climate change is also shifting pest and disease dynamics, posing further risks to farmers (Hossain et al., 2021; Kantamaneni et al., 2020).



Extreme weather events: Cyclones, floods, heatwaves, and cold waves delay planting, damage crops, and disrupt logistics, leading to increased waste and higher costs. These events can destroy infrastructure and delay harvests, further affecting supply chains (Islam, 2018; Kantamaneni et al., 2020; Mitu, 2020).



Market and price volatility: Unpredictable market fluctuations, supply disruptions, and lack of transparent pricing mechanisms create uncertainty for both producers and consumers (Haque et al., 2022). Price volatility, due to global and local market conditions, hampers investment and planning (Guenette, 2020).



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Pest and disease threats: Climate change and increased trade have led to more frequent pest and disease outbreaks, causing significant crop losses and financial challenges for farmers (Farouque et al., 2024).



Middlemen domination: Middlemen control market pricing and often exploit farmers by offering low farmgate prices, reducing profitability and transparency in the supply chain (Gazi, 2020).



Rising input costs: Increasing costs for seeds, fertilizers, and other inputs, combined with lower farmgate prices, squeeze profit margins and threaten the sustainability of farming, particularly for smallholders (Choudhury et al., 2024).



Shift toward fast food: The growing preference for fast food is reducing demand for fresh fruits and vegetables, with potential long-term impacts on the sector's growth and public health (Mostert et al., 2022; Pamuk et al., 2021).



Preference for imported produce: The popularity of imported fruits and vegetables among consumers could reduce the demand for locally produced options, undermining food security and domestic agricultural self-sufficiency (Haque and Hoque, 2020).

Scenario analysis: fruit and vegetable production and consumption in Bangladesh

In addition to the uncertainties outlined, we considered all food system drivers (Barois et al., 2024) and specific drivers for the fruits and vegetables sector (Pamuk et al., 2021). These drivers were analysed based on their importance and level of uncertainty (Figure 5), with the most critical identified for scenario analysis:

- **Climate resilience, extreme weather events, and seasonality**
- **Business structure**
- **Market and price fluctuations**
- **Consumption patterns** (population demand, healthy vs. unhealthy, sustainable vs. unsustainable consumption, equity, and inclusiveness)
- **Input constraints**
- **Pest and disease infestation and excessive pesticide use**

To conduct a scenario analysis, the first five drivers were placed into different combinations, resulting in five possible scenarios. These scenarios, discussed below, provide a valuable framework for understanding future food security in Bangladesh by 2050, by reflecting various potential outcomes for food demand and availability.

The sixth identified driver, pest and disease infestations, is closely linked to climate vulnerability and extreme weather events. Climate change alters temperature, humidity, and precipitation patterns, which intensifies pest and disease risks. For this reason, pest and disease infestation was not included as a separate driver in the scenario analysis.

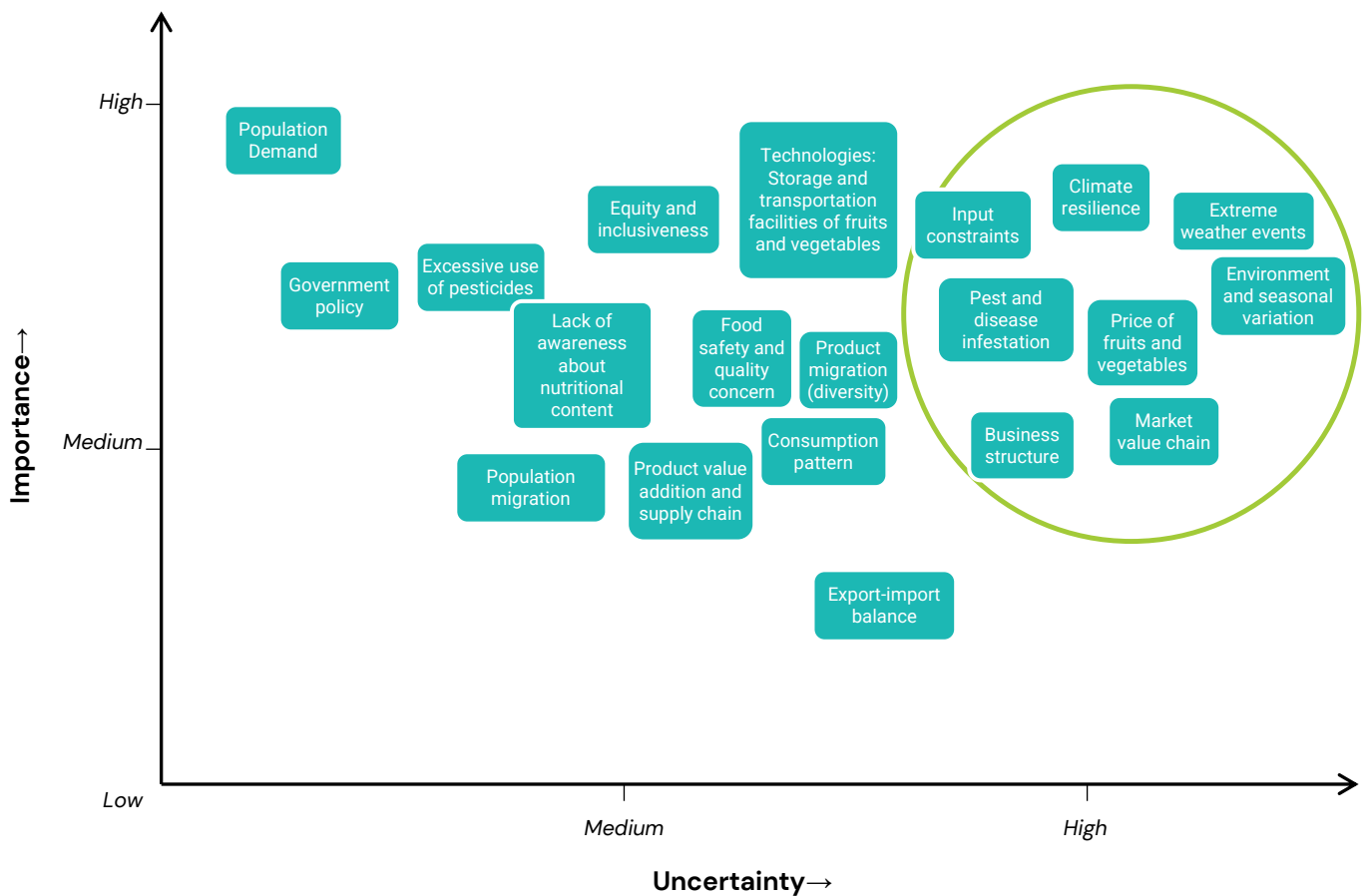


Figure 5: Drivers of fruit and vegetable sectors by uncertainties and importance

The five scenarios impact different stakeholders, including producers, middlemen, businesses (exporters and importers), processors, retailers, consumers, government, researchers, and input suppliers. Depending on the scenario, stakeholders may need to adapt their roles accordingly.

Scenario 1: Vulnerable climate, unstable market

In this scenario, Bangladesh faces severe climate vulnerability, disrupted food production, market domination by large-scale businesses, poorly functioning markets, and input constraints. Fruit and vegetable production decreases, leading to lower availability, and large-scale businesses controlling the sector could restrict access for smaller farmers, exacerbating inequity in the food system. Input shortages reduce production, leading to higher prices and unstable markets. Consumers maintain unhealthy eating habits and may shift towards cheaper processed foods, worsening nutritional deficiencies. Rising prices make fruits and vegetables unaffordable for many, leading to severe malnutrition and health issues in Bangladesh.

Scenario 2: Unstable market, unhealthy consumption

In this scenario, Bangladesh demonstrates climate resilience, which allows for steady production. However, the fruit and vegetable markets are poorly functioning – dominated by large businesses, plagued with inefficiencies, and facing input constraints that limit access. Price increases impact lower-income families, and low consumption of fruits and vegetables worsens malnutrition and health disparities.

Scenario 3: Vulnerable climate, unstable market, healthy consumption

In this scenario, Bangladesh faces climate vulnerability. While diversified businesses (micro-, small-, medium-, and large-scale enterprises) coexist, the market remains unstable. Climate disruptions lower production, but the diversified business structure allows for more equitable distribution. Despite input constraints, consumers maintain healthy, sustainable eating habits, which encourages innovation in climate-resilient solutions and local initiatives. This could help mitigate some of the negative effects of climate disruption on production.

Scenario 4: Vulnerable climate, stable market

In this scenario, Bangladesh suffers from climate disruptions, but the market functions well, businesses are diversified, and there are no input constraints. Despite production disruptions, an efficient market ensures proper distribution. Consumers adopt healthy and sustainable eating habits, maintaining demand for fruits and vegetables. This encourages innovation in climate-resilient farming practices, while stable pricing makes produce accessible to most consumers.

Scenario 5: Resilient climate, stable market

In the most favorable scenario, Bangladesh is climate-resilient, markets function well, businesses are diversified, input constraints are minimized, and consumers prioritize healthy diets. Efficient distribution and competitive market conditions lead to steady supply and demand, minimizing waste. A stable agricultural sector supports affordable prices and consistent access to nutritious foods for all consumers. Together these factors create a robust and sustainable system for fruit and vegetable production and consumption.



Image credit: IFAD/GMB Akash

Policy recommendations

While production and consumption of fruits and vegetables in Bangladesh has grown, demand still outpaces supply and consumption remains below recommended levels. Several factors, including climate change, market inefficiencies, and consumer behaviour, impact this gap. The following five policy recommendations would support sustainable production and increase consumption of healthier diets in Bangladesh:



Image credit: IFAD/GMB Akash



Promote climate resilience: To address climate change effects (e.g., heat stress, floods, and salinity), the government should support the adoption of climate-resilient technologies, such as improved crop varieties, mechanization, and greenhouse farming. Collaborations between government agencies, agricultural institutions, and non-governmental organizations (NGOs) can provide training programs and subsidies to farmers, ensuring widespread adoption of technological solutions. Contingency plans should also be developed to support both producers and consumers during external shocks.



Improve infrastructure and minimize food loss: Investment by government and private sector in modern storage, transportation, and post-harvest processing facilities is essential to reduce food loss. Public-private partnerships can enhance infrastructure and ensure efficient management of these resources – leading to reduced food waste, increased product shelf life, and improved access to nutritious foods throughout the supply chain (Jarman et al., 2023).



Strengthen market linkages: It is crucial to reduce intermediaries and streamline the connection between producers and consumers. Digital marketplaces, direct sales platforms, and home delivery services allow farmers to sell directly to consumers, improving market efficiency. Strengthening cooperatives and providing training on digital tools will empower farmers to take advantage of these opportunities, improving income and reducing waste (Pesci, 2023; Boys and Fraser, 2019; Stephens and Barbier, 2021).



Raise awareness of nutrition and healthy diets: Nutrition-specific value chains should be strengthened to increase access to fruits and vegetables. The government, NGOs, and community organizations should lead awareness campaigns on the importance of healthy diets, targeting key groups such as school children, pregnant women, and low-income households. School programs and media outreach can promote the benefits of diversified diets, while also educating consumers on reducing food waste (Gelli et al., 2020; Kraemer et al., 2016; Peña et al., 2018; Donovan and Gelli, 2019).



Optimize regional production and marketing: Tailoring production methods to regional conditions is critical in optimizing fruit and vegetable yields. The Ministry of Agriculture, local governments, and research institutes should collaborate to identify region-specific crops suited to different Agroecological Zones (AEZ) (Fanchone et al., 2020; Antwi-Agyei et al., 2021; Ketema et al., 2021). This approach will optimize land use, improve marketing strategies, and ensure stable supply and demand across Bangladesh (Yeasmin et al., 2020).

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