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The Impact of Reduction in Arable Land on Food Security in Bangladesh

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Abstract *The primary objective of this study is to assess the impact of reduced arable land on food security and to explore potential remedies for addressing these issues. The study also examines the trends of declining agricultural growth and increasing population, as well as other factors contributing to food insecurity in Bangladesh. Data are gathered from a variety of secondary sources to meet the study's goals, including pertinent peer-reviewed journal articles, newspaper articles, the Bangladesh Bureau of Statistics (BBS), the Bangladesh Economic Review, the World Bank, the World Economic Outlook, policy briefs, and blogs about different climate and agriculture issues in Bangladesh. The study's key conclusion is that the shrinking amount of arable land available for cultivation increasingly threatens food security. Important steps, such as introducing awareness programmes, securing governmental support, creating appropriate rules and regulations, and ensuring their effective implementation, could help mitigate the current adverse effects, ensure food security for the growing population, and address climate vulnerabilities in Bangladesh. The most important implication of the study is that policymakers working in agro-based private and government organisations may consider these findings to formulate a safe and profitable agricultural system, as well as a hunger-free economy.*

Keywords *Arable Land, Climate Change, Agricultural Growth, Food Security, Bangladesh*

INTRODUCTION

One of the world's agro-based developing countries with the quickest rate of growth is Bangladesh. Despite a growing population, an unstable climate, the COVID-19 pandemic, and ongoing conflict between Russia and Ukraine, Bangladesh has made significant strides in agricultural productivity and ensured food security. Bangladesh has become self-sufficient in food grain production, ranking third in rice production, third in vegetable production, and seventh in potato and mango production (Bangladesh Economic Review, 2023). Approximately 62% of the population works in agriculture, relying on agricultural output for subsistence (Rezvi, 2018). Approximately 77% of Bangladesh's labour force and 70% of its population live in rural areas. Over half of all workers in Bangladesh, including two-thirds in rural areas, are directly employed in the agricultural sector, and 87% of rural households in the country rely on it for at least some of their income (World Bank, 2016). For Bangladesh, climate change presents significant barriers to sustainable development. By 2050, sea level rise caused by climate change is expected to cover 17% of Bangladesh's land area, reducing arable land and leaving 35 million people without access to land (Ismail, 2016). Up to 30% of the country experiences flooding each year during the monsoon season, and 60% of the country is vulnerable to extreme flooding. The majority of the landmass is composed of floodplains (UNESCAP, 2013).

All-out efforts are being made to develop the agricultural sector as a whole. Agricultural land is being converted to non-agricultural land, according to the majority of national planning documents, including the National Agricultural Policy 2018, the National Agricultural Mechanisation Policy 2020, the Eighth-Fifth-Year Plan, the Sustainable Development Goals, Vision 2041, Delta Plan 2100, and others. Bangladesh's total arable land area has declined from 73.4% in 1989 to 61.5% in 2020, according to World Bank data. This decline in agricultural land could threaten the country's future food security.

Being a delta, Bangladesh frequently faces cyclones, floods, storms, droughts, and erosion, among other climate-related natural calamities. Crop output is at risk due to climate change. Agricultural production is consequently falling annually. Consequently, it lowers the market's food supply in response to consumer demand. To meet

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domestic demand, the government imported food from other countries. A substantial portion of the national GDP is derived from agriculture. However, the contribution rate to national GDP has declined over time, from 17% in 2010 to 11.52% in 2021–22. Fast economic development and population growth, pressure on agricultural land from rapid urbanisation, and climate change are some of the factors contributing to Bangladesh's declining agricultural growth.

Although food self-sufficiency has been achieved and food production has increased over time, food security cannot be guaranteed solely by these factors, even with population growth. Although food production is increasing, some staples, including rice, wheat, soybeans, and pulses, are still imported. Since food security in Bangladesh has declined over the past few years, the country remains under-equipped to guarantee food security for all.

LITERATURE REVIEW

Bangladesh's economy relies heavily on agriculture, which also plays a crucial role in the country's ongoing economic development. The phrase 'food security and climate change' has gained international attention. Agricultural land is one of the very important inputs of food grain production. In today's Bangladesh, declining arable land and climate change are increasingly important for ensuring food security, which is crucial for effective strategy formulation. Regarding shared understanding, all phrases discuss agriculture's contributions to society, including growth, environmental preservation, and other key areas. This study examines academic publications and ideas that have influenced recent debates on possible threats to agriculture and food security.

At least 25% of Bangladesh's agricultural land would have been lost since independence, according to a study by Hasan et al. (2013) titled 'Agricultural Land Availability in Bangladesh'. Furthermore, Hasan et al. (2013) noted that agricultural land has declined by approximately 0.26% annually from 1976 to 2010–11. The yearly average loss of agricultural land was 23,391 hectares and 56,537 hectares during the periods 1976–2000 and 2000–10, respectively.

Khan (2017) conducted a study titled 'The Transformation of Bangladesh's Agriculture', which posited that although Bangladesh has made considerable progress in agriculture, the proportion of the labour force employed in or making a living from it has not decreased in tandem with the country's remarkable agricultural growth.

Despite numerous issues and limitations, a quiet agricultural revolution has enabled the country to meet its national food security targets in food grain production, according to Shahabuddin et al.'s (2017) research study, 'Agricultural and Food Policy Framework in Bangladesh: An Assessment'. Numerous factors, including natural disasters, population growth, urbanisation, new technologies, opportunities in the rural non-farm sector, and commercialisation, are driving agriculture to continue evolving.

Lewis (1954) contended that his "two-sector model" encourages industrialisation by transferring excess labour from the traditional sector to the modern industrial sectors. A modern industrial sector might quickly replace traditional agriculture.

'Agricultural Crisis in India: The Root Cause and Consequence' is the title of a paper by Dhas (2009), who determined that population pressure, climate change, and pressure on arable land were the primary factors contributing to India's declining agricultural growth.

A research titled 'A review of agricultural production status from the perspective of food security' by Ghose et al. (2014) noted Bangladesh's agricultural sector's share of GDP has decreased sharply. In an article titled 'Bangladesh Crop Agriculture: Challenges and Opportunities' by Mondal (2010), crop agriculture in Bangladesh is now frequently at risk from climate change-related disasters, including salinity, drought, and flooding.

In a study titled 'Impacts of climate change on agriculture and food security in Bangladesh', Hossain et al. (2016) explained that the adverse effects on food production, where the majority of farmers noticed unfavourable changes in weather patterns, may raise the risk of food insecurity in Bangladesh.

According to a study by Ismail et al. (2021) titled 'Investigating the Effect of Climate Change on Food Loss and Food Security in Bangladesh', Bangladesh has long been battling climate variability and extreme weather events to reduce the loss of agricultural production. Food loss significantly contributes to inflation, whereas food grain loss has the opposite effect on food security, leading to increased imports from the global food market.

Rezvi (2018) conducted a significant study titled 'The factors of declining agricultural growth in Bangladesh and its impact on food security', which explained that the country's climate change is hurting agricultural growth. Food insecurity is increasing due to declining agricultural growth. Alam et al. (2015) conducted a study titled 'The decreasing trend of agricultural land in Bangladesh: Myth and facts', showing that agricultural land has decreased by 0.29% over the last 40 years. If the current decreasing trend continues, by 2050, per-person land availability may be as low as 0.037 hectares, supporting a population of 202 million. At that time, a significant challenge for Bangladesh would be managing food for its huge population on only 7.51 million hectares of land.

In their study 'Insights on land use, agriculture, and food security in Bangladesh: way forward with climate change and development', Rozario et al. (2021) concluded that climate change poses a threat to Bangladesh's agricultural sector. Rapid economic and population growth, as evidenced by infrastructure expansion, is also reducing the amount of available land. The country's capacity to produce enough food to satisfy rising demand in the ensuing decades may be threatened by these changes.

From the above discussion, it is clear that arable land is declining, and numerous other threats to food security in Bangladesh exist. In this regard, the present researcher aims to determine whether the decline in arable land poses a threat to food security in Bangladesh.

The remainder of this paper is organised as follows: Section 3 presents the objectives of the study, followed by the methodology in Section 4. The findings are presented in Section 5, where subsections 5.1 and 5.2 provide the results analysis and discussion, respectively. Section 6 then reflects the implications and policy recommendations. Last, the conclusions are presented in Section 7.

OBJECTIVES OF THE STUDY

The primary objective of this study is to assess the impact of reduced arable land on food security in Bangladesh. Also, the specific objectives are:

- To focus on the trend analysis of the contribution of the agriculture sector's growth to GDP, especially from 2015–16 to 2021–24.
- To analyse the role of declining agricultural growth on food security in the long term.

RESEARCH METHODS

The materials and procedures used in this investigation are described in the current section. These consist of the type of data, the sources used to obtain it, and the methods used to analyse it. Primarily qualitative, this study is founded on secondary data gathered from a variety of sources, including pertinent peer-reviewed journal articles, newspaper articles, the Bangladesh Bureau of Statistics (BBS), the Bangladesh Economic Review, the World Bank, the World Economic Outlook, policy briefs, and blogs about various climate and agriculture-related topics in Bangladesh. The researcher carefully studied related texts, annual reports of various organisations, and other relevant documents on agriculture to serve the research purpose.

FINDINGS

Analysis of the Findings

Table 1: Agricultural Growth Rate (2015–16 to 2023–24)

Period	GDP
2015–16	2.79
2016–17	3.2
2017–18	3.54
2018–19	3.26
2019–20	3.42
2020–21	3.17
2021–22	3.05
2021–23	3.37
2023–24	3.21

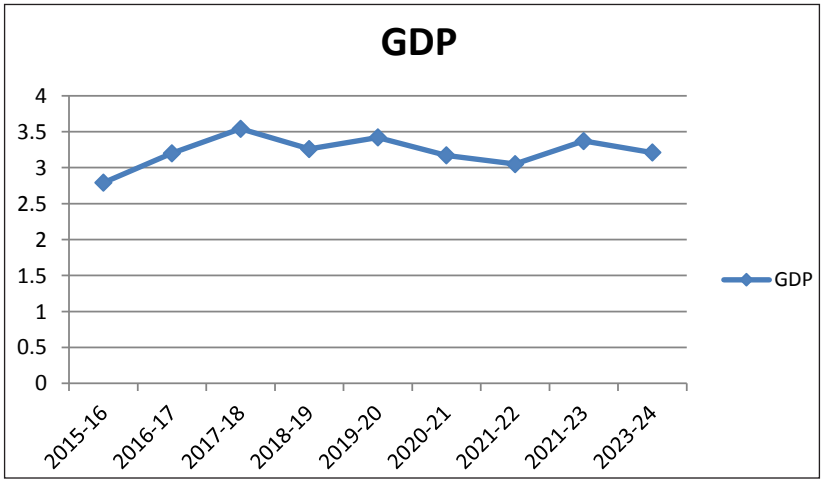

Fig. 1: Agricultural Growth Rate (2015–16 to 2023–24)

Table 1 shows that agricultural growth in Bangladesh experienced a gradual rise during the early years, increasing from 2.79% in 2015–16 to 3.54% in 2017–18. This early improvement reflects favourable climatic conditions, increased use of modern farming technologies, and effective policy support. However, after 2017–18, the growth rate begins to fluctuate, and a clear declining pattern emerges, particularly during 2019–20 to 2021–22, when growth fell from 3.42% to 3.05%. This period corresponds to several adverse events – the COVID-19 pandemic disruptions, floods, storms, and other climate-related shocks. Although there was a slight recovery after 2021–22, growth remains unstable, indicating that Bangladesh's agriculture sector continues to face structural and environmental challenges.

Table 2: Contribution of Agriculture and Industrial Sector in GDP (%) at Constant Prices (Base Year: 2015–16)

Period	Agriculture Contribution in GDP (%)	Industrial Contribution in GDP (%)
2015–16	14.06	32.45
2016–17	13.62	32.98
2017–18	13.14	33.85
2018–19	12.56	34.99
2019–20	12.52	34.94
2020–21	12.07	36.01
2021–22	11.61	36.92
2022–23	11.30	37.65
2023–24	11.02	37.95

Source: Bangladesh Bureau of Statistics.

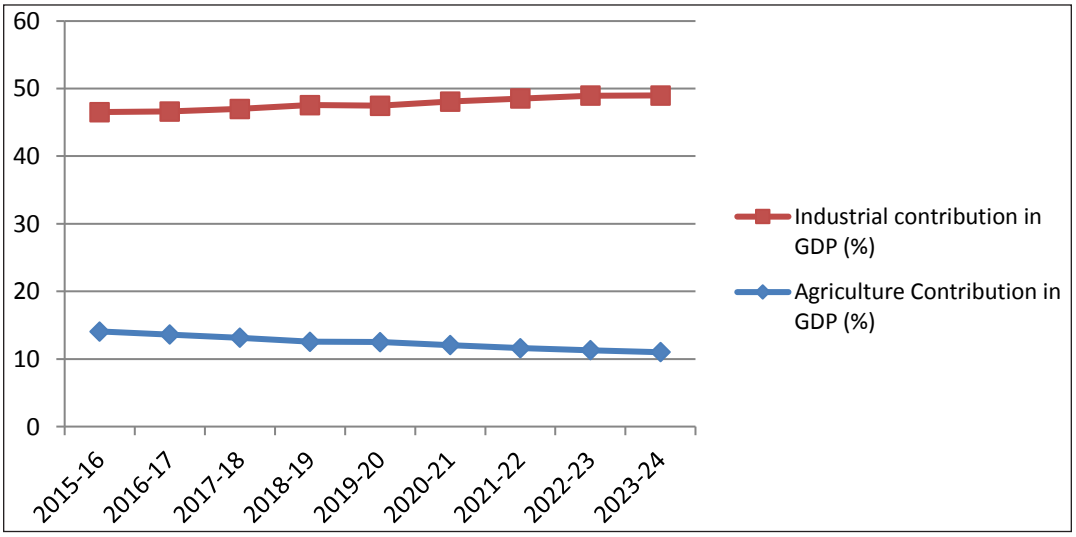

Fig. 2: Contribution of Agriculture and Industrial Sector in GDP (%) at Constant Prices (Base Year: 2015–16)

Table 2 highlights a steady decline in the agricultural sector's share of GDP, falling from 14.06% in 2015–16 to 11.02% in 2023–24. This decline indicates a structural transformation, where the economy is moving away from agriculture towards more industrial activities. In contrast, the industrial sector shows continuous expansion – from 32.45% in 2015–16 to 37.95% in 2023–24. This shift suggests rapid industrialisation, increased manufacturing capacity, and expanded private-sector participation in industry. The decreasing share of agriculture, despite employing a large portion of the population, signals that agricultural productivity is not rising at the same rate as the rest of the economy – posing long-term risks to food security and rural livelihoods.

Table 3: Urban Population Growth (as a Percentage of Total Population) and Available Arable Land (as a Percentage of Total Land), 1971–2024

Period	Arable Land (% of Total Land)	Urban Population Growth (% of Total Population)
1971	67.88	7.91
1981	69.97	15.81
1991	72..09	20.25
2001	63.78	24.09
2011	58.98	31.22
2018	59.79	36.63
2019	59.61	37.4
2020	59.45	39.4
2021	59.25	39.9
2022	59.05	40.4
2023	50.01	41.0
2024	60.60	41.6

Source: World Bank, 2024.

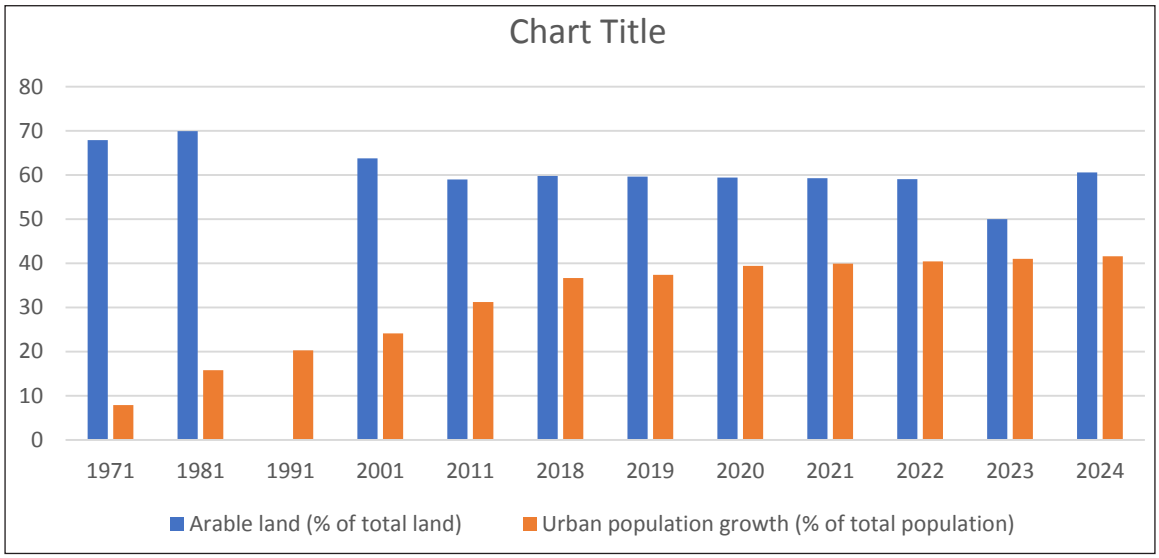

Fig. 3: Available Arable Land (% of Total Land) and Urban Population Growth (% of Total Population) (1971–2024)

Table 3 reveals two contrasting long-term trends:

- Arable land as a percentage of total land has been decreasing, falling from 67–72% in the 1970s and 1990s to around 59% by 2020–22, and further fluctuating thereafter
- Urban population as a percentage of total population has sharply increased, rising from just 7.91% in 1971 to 41.6% in 2024.

These patterns indicate that rapid population growth, urban expansion, and infrastructure development are major contributors to the loss of agricultural land. As cities expand horizontally, agricultural land is frequently converted to non-farm uses such as housing, roads, industries, and commercial development. The continuous reduction in arable land highlights future risks for domestic food production, especially when combined with rapidly rising urban food demand.

Table 4: Available Arable Land, Food Demand, and Grain Production for the Growing Population in Bangladesh (1971–2024)

Period	Arable Land (Mha)	Food Production (MT)	Food Demand (MT)	Population (Million)
1971–72	8.95	9.89	14.4	66.63
2000–01	8.19	24.25	21.73	130.1
2009–10	7.73	30.79	27.6	147.6
2014–15	7.69	33.28	29.82	156.3
2019–20	7.53	35.70	32.03	164.7
2021–22	7.40	39.15	34.36	169.8
2022–23	7.31	40.27	37.65	171.5
2023–24	7.10	41.87	40.30	173.6

Source: World Bank Report, 2020–24.

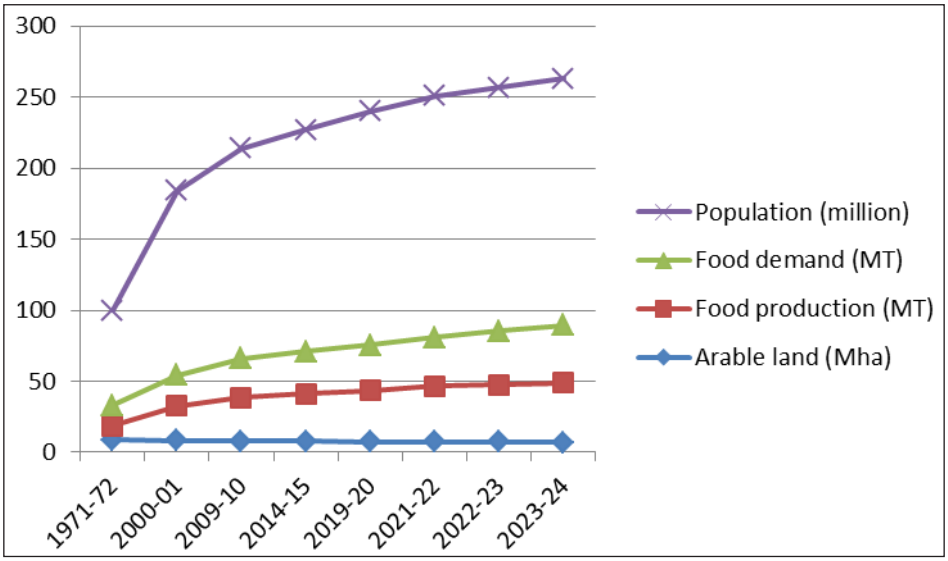

Fig. 4: Available Arable Land, Food Demand, and Grain Production for the Growing Population in Bangladesh (1971–2024)

Table 4 demonstrates that arable land has steadily declined from 8.95 million hectares (Mha) in 1971–72 to just 7.10 Mha in 2023–24. In contrast, food grain production has increased significantly, from 9.89 million tons in 1971–72 to 41.87 million tons in 2023–24, due to the adoption of high-yield varieties, irrigation expansion, and modern farming technologies. Nevertheless, food demand has also increased sharply – from 14.4 MT in 1971–72 to 40.30 MT in 2023–24, driven by population growth from 66.63 million to 173.6 million during the same period.

Table 5: Food Grains Production (2015-16 to 2023-24) (In Lakh MT)

Food Grains	2015–16	2016–17	2017–18	2018–19	2019–20	2020–21	2021–22	2022–23	2023–24
Aus	22.89	21.34	27.20	27.20	30.12	32.85	32.45	29.01	29.72
Amon	134.89	136.56	139.94	140.55	155.02	144.38	149.58	154.33	166.56
Boro	189.38	180.16	195.76	203.89	201.81	198.85	209.77	207.67	224.32
Wheat	13.48	13.12	10.99	11.48	12.46	10.85	10.86	11.71	11.72
Maize	27.59	35.78	38.93	46.99	54.02	56.63	56.30	64.32	68.84
Total	388.17	386.96	412.71	432.11	453.44	443.56	458.96	467.04	501.17

Source: Bangladesh Economic Review, 2024.

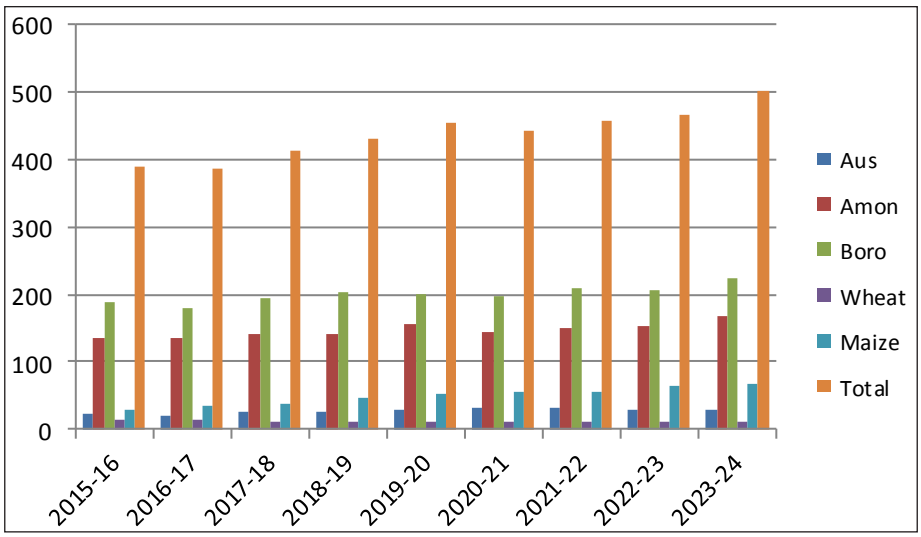

Fig. 5: Food Grains Production Measured in Lakh MT from 2015–16 to 2023–24

Purpose of the Table

To track the production of major food grains and assess whether increased output compensates for declining arable land.

Explanation

Table 5 shows strong growth in total food grain production, rising from 388.17 lakh MT in 2015–16 to 501.17 lakh MT in 2023–24. The increase is largely driven by Boro rice and maize, both of which show substantial gains over the period. For instance:

- Boro production increased from 189.38 to 224.32 lakh MT, benefiting from irrigation and improved seeds.
- Maize production grew dramatically, from 27.59 to 68.84 lakh MT, due to rising demand for poultry and dairy feed.

Wheat, however, shows relatively stagnant production, fluctuating around 10–13 lakh MT due to climatic constraints and limited expansion of wheat-growing areas.

Despite declining agricultural land, total grain output continues to rise. This suggests that Bangladesh has achieved success through intensification strategies – higher yields per hectare rather than increased land use. However, this growth also increases pressure on natural resources, soil fertility, and water availability, which may not be sustainable in the long term.

Discussions

Although Bangladesh is experiencing rapid growth, it relies heavily on agriculture. A significant proportion of the population relies on agriculture for its livelihood. The findings of this study highlight a complex interaction between declining arable land, rapid urbanisation, and increasing food demand in Bangladesh. Although total food grain production has risen due to the adoption of high-yield varieties, irrigation expansion, and advances in agricultural technologies, this growth has not fully offset the pressure created by population expansion and the conversion of agricultural land to non-farm uses. The declining share of agriculture in GDP, despite the sector's vital role in employment, signals structural weaknesses and productivity challenges. Moreover, climate change intensifies these vulnerabilities through recurrent floods, salinity intrusion, cyclones, and droughts, which threaten crop yields and long-term food stability. When rising food demand is juxtaposed with shrinking land resources, it becomes evident that Bangladesh faces mounting challenges in sustaining future food security. The results therefore underscore the need for integrated land management policies, climate-resilient farming strategies, and long-term planning that prioritises sustainable agricultural intensification.

IMPLICATIONS AND POLICY RECOMMENDATIONS

This study primarily aims to investigate the impact of agricultural land decrease and to suggest ways to address

these challenges. The study's findings indicate several solutions to the challenges facing Bangladesh's agriculture and ecology. For policymakers, the government, the agro-based business sector, and others, the study's findings are pertinent and instructive. Secondary data served as the basis for this investigation. As a result, the relevant authorities, government agencies, and other organisations value these observations and recommendations. When creating relevant regulatory rules and frameworks to address agricultural and environmentally friendly challenges, policymakers may consider these factors.

The following suggestions are given in light of the analyses and conclusions drawn to address the issues facing Bangladesh's agriculture sector, help the government formulate policies, and guarantee their highest level execution:

- In the year of the competitive agro-based business sector, private sector companies should prioritise educating their employees about environmental issues, such as effective waste management, the establishment of water treatment plants, recycling facilities, renewable energy, and more. To ensure long-term food grain production and survival, this is strategically crucial.
- The government significantly influences the development of agriculture. In the event of a climatic crisis, the government may be able to provide targeted assistance to investors and agro-based businesses that actively promote environmental preservation. These could include free training programmes for investors to raise awareness of climate vulnerabilities, technological assistance from research institutes to advance industrial environmental technology, financial support to encourage green environment-related activities (such as tax holidays or low-interest rates for credit), and incentive and reward programmes for environmental preferential treatment.
- The government can also play an important role through its institutions by creating and enforcing laws that require all sectors to use agricultural land in certain specific areas that must be favourable to investors, such as plantations and the green environment.
- People should have the correct information at the right time to promote long-term agricultural development because the modern world primarily depends on the availability of high-quality information in the right quantity and at the right time.
- Promoting a positive outlook on land-saving technology practices may help to overcome the present obstacles.

CONCLUSION

Over the past two to three decades, Bangladesh's economic reliance has shifted from agriculture to industry. Although the agriculture sector's share of the GDP is decreasing, it continues to make a variety of contributions to society. The study demonstrates that the continuous reduction in arable land poses a significant and rising threat to Bangladesh's food security, particularly in the context of rapid population growth and climate-induced disruptions. Although agricultural production has improved, this progress is heavily dependent on intensified resource use, which may not be sustainable in the long run. The country's ongoing structural shift towards industry further reduces the relative contribution of agriculture, underscoring the urgent need to protect remaining cultivable land and strengthen climate-resilient agricultural systems. Ensuring future food security will require co-ordinated efforts from government, policymakers, private-sector actors, and farming communities to adopt environmentally responsible practices, enforce land-use regulations, and invest in modern, efficient, and sustainable agricultural technologies. Without these strategic interventions, Bangladesh may face increasing difficulty in meeting the food needs of its growing population in the coming decades.

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