



General Economics Division (GED)
Bangladesh Planning Commission

GED POLICY BRIEF

NO. 01-2026

AGRICULTURAL TRANSFORMATION IN BANGLADESH

A Strategic Framework for Sustainable Development

Key Issues

1. Structural Issues

- i) The agricultural landscape of Bangladesh is characterized by smallholder dominance, with average farm sizes declining from 1.5 hectares in the 1960s to 0.6 hectares in 2021. This fragmentation presents both challenges and opportunities for strategic intervention.
- ii) Rice production dominates the cropping pattern, occupying approximately 75 percent of cultivated area and contributing nearly 70 percent of caloric intake. Productivity gains and crop diversification are key to future agricultural transformation.

2. Critical Constraints and Challenges

- i) Production and productivity constraints due to land scarcity and labor market transformation
- ii) Technology adoption barrier in both supply side and demand side
- iii) Value chain inefficiencies such as price volatility, quality failures and post-harvest losses.

3. Priority Policy Areas

- i) Modernizing agricultural extension services,
- ii) Strengthening digital extension platforms,
- iii) Establishing farmer service centers which will work as one-stop agricultural hubs.

4. Proposed Five Strategic Pillars for Agricultural Transformation

- i) Technology led intensification, ii) Strategic crop diversification, iii) Market system development, iv) Climate smart agriculture, v) Institutional strengthening.

Overview

The agricultural sector of Bangladesh requires a renewed strategic focus to address emerging challenges of food security, poverty, and rural unemployment. Despite the declining share of the sector in gross domestic product (from 38 percent in the 1970s to 11.3 percent in fiscal year 2022-23), agriculture remains fundamental to the nation's economic health, employing 45 percent of the labour force and serving as the basis of food security and rural livelihoods.

Bangladesh has developed an extensive policy architecture for agricultural development, including the National Agriculture Policy 2018, the National Agricultural Mechanization Policy 2020, the National Agricultural Extension Policy 2012, and the National Agricultural Marketing Policy 2023. This policy brief does not propose new physical targets but rather identifies constraints that impede the achievement of existing program goals and recommends ways to improve performance.

This brief is structured in eight sections. It discusses the structural characteristics of the agricultural landscape of Bangladesh, current program and policy landscape. It also points out some critical constraints and challenges such as production and productivity constraints, technology adoption barrier, value chain inefficiencies in the agricultural sector. It proposes the priority policy areas with three-pronged transformation strategies: strengthening traditional extension services, strengthening digital extension platforms and establishing farmer service centers. Finally, it lays out five strategic pillars for program improvement: technology-led intensification, strategic crop diversification, market system development, climate-smart agriculture, and institutional strengthening.

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Date of publication: 25 January 2026

1. Introduction and Context

1.1 Historical Evolution and Current Status

The experience of Bangladesh in 1974 when it experienced a famine that not only resulted in large-scale mortality but also left the new nation deeply traumatized (Sen, A. 1982). The Bangladesh government has since, always remained vigilant about food security, with food self-sufficiency high on the policy agenda. The broader vision is to consolidate its success in achieving rice self-sufficiency while also looking to diversify into non-rice food and feed crops to enable the population to have better access to a more diverse, nutritionally rich diet to quickly reduce malnutrition (Ministry of Agriculture, 2018).

Bangladesh's agricultural sector has undergone remarkable transformation since independence, evolving from a food-deficient nation to achieving near self-sufficiency in rice production. The country has an impressive track record of agricultural growth since the mid-1990s, with the sector growing between 3-4 percent annually over the period 1996-2019. Rice production has become more than doubled from 17 million metric tons in 1994-95 to 36 million metric tons in 2019-2020. However, growth rates have decelerated to approximately 3 percent in recent years, signaling the need for renewed strategic focus (World Bank, 2023; MCCI, 2024).

Key Sector Statistics

- **Agricultural GDP share:** 11.3% in FY2022-23 (down from 38% in 1970s)
- **Employment:** 45% of the labor force
- **FY2023-24 food grain production:** 501.17 lakh MT
- **Agricultural credit disbursement:** BDT 37,154 crore (106% of target)
- **Growth rate deceleration:** 4%+ (1996-2019) to 3.21% (FY2023-24)

Sources: Bangladesh Economic Review (2024); Diao, et al. (2023)

1.2 Structural Characteristics

The agricultural landscape of Bangladesh is characterized by smallholder dominance, with average farm sizes declining from 1.5 hectares in the 1960s to 0.6 hectares in 2021. This fragmentation presents both challenges and opportunities for strategic intervention. On the positive side, the smallholder structure ensures broad-based participation in agricultural development and provides a natural buffer against rural unemployment (Husain and Hussain, 2022).

Rice production dominates the cropping pattern, occupying approximately 75 percent of cultivated area and contributing nearly 70 percent of caloric intake. The country has achieved substantial productivity gains, with rice yields increasing from 1.7 tons per hectare in 1971 to 4.8 tons per hectare in 2023. However, this achievement masks significant yield gaps, with yields under optimal conditions reaching 6-7 tons per hectare for high-yielding varieties such as BRRI Dhan 107 and 108 (World Bank 2023, Akhter, U. et al., 2024).

2. Current Policy and Program Landscape

2.1 National Policy Framework

The agricultural sector operates under an extensive policy framework that has evolved substantially over the past decade:

National Agriculture Policy 2018: This overarching policy prioritizes diversification, commercialization, and mechanization as specific goals for transforming agriculture toward a more productive, profitable, and sustainable system.

National Agricultural Mechanization Policy 2020: Envisions the transition to efficient, profitable, and commercial agriculture through mechanization. Critical assessments have identified gaps, including inadequate attention to post-harvest processing, storage management, and local manufacturing capacity.

National Agricultural Extension Policy 2012: Seeks efficient, effective, coordinated, and decentralized extension services. However, implementation has been constrained by human resource limitations, with the Department of Agricultural Extension (DAE) operating as a largely top-down system with limited research-extension linkages.

National Agricultural Marketing Policy 2023: Focuses on improving market linkages and reducing post-harvest losses, though implementation mechanisms are still being developed.

2.2 Assessment of Program Performance

An assessment reveals that while Bangladesh has developed ambitious policies and mobilized substantial resources, several systemic issues constrain program effectiveness:

Systemic Implementation Issues

- Demand-side barriers receive insufficient attention: Programs focus on supply-side interventions while underinvesting in why farmers do not adopt available technologies
- Implementation quality varies significantly: Field verification reveals discrepancies between reported and actual outcomes
- Institutional coordination remains weak: Multiple agencies implement overlapping programs with limited coordination
- Post-harvest infrastructure severely lags: Storage is concentrated on potatoes, leaving other commodities vulnerable
- Targets may be over-ambitious: 60% certified seed by 2027 from 35% base would require unprecedented acceleration

Mechanization Program Gaps

- Market actors inflate retail prices in anticipation of subsidies, effectively capturing subsidy value
- Gaps in training, warranty support, and after-sales service undermine operational sustainability
- Demand-side barriers (high costs, limited financing) remain unaddressed despite supply-side interventions
- Three-year resale restriction limits market flexibility

3. Critical Constraints and Challenges

3.1 Production and Productivity Constraints

Land scarcity, compounded by continuous fragmentation over generations, has emerged as a critical structural constraint. Agricultural land is decreasing by approximately 0.5 percent annually due to urbanization and industrial growth. The country's population density of 1,265 people per square kilometer intensifies pressure on agricultural resources (FAO, 2014).

Labor Market Transformation

- On-farm labor employment declined from 43% (2017) to an estimated 36% (2020), projected 20% by 2030 (Akhter, U. et al., 2024).
- Daily agricultural wages increased from BDT 300 (2015) to BDT 583 (2024) – over 90% nominal increase (Karim, et al., 2024).
- Real wages (rice equivalent) rose from 5 kg/day (2000-2007) to 10-11 kg/day (current) (Karim et al., 2024).

3.2 Technology Adoption Barriers

Mechanization illustrates the complex interplay of supply and demand-side barriers that limit technology adoption across the agricultural sector.

Current Mechanization Status

- High mechanization (>90%): land preparation, irrigation, threshing, pesticide application (Hossen, 2019).
- Low mechanization (<2%): planting and harvesting operations (Hossen, 2019).
- Only 50% of farmers access power tillers/tractors (vs. >80% in India) (Hossen, 2019)

Key Finding: Dual Barriers to Technology Adoption

- **Supply-side:** Machinery inefficiency on small holdings, poor infrastructure, limited spare parts (BDT 1,300 crore annual market), weak repair networks
- **Demand-side:** High costs are unaffordable even with 50-70% subsidies, restricted credit access, limited awareness of economic benefits, risk aversion

Source: Akhter, U. (2024)

3.3 Value Chain Inefficiencies

Agricultural markets continue to face price volatility, quality failures, and post-harvest losses that reduce farmer incomes and increase consumer prices (BINA, 2024).

Post-Harvest Loss Rates:

Annual post-harvest losses estimated at US\$2.4 billion (16 million tons of food grains). Specific percentage of losses are given in figure 1 below.

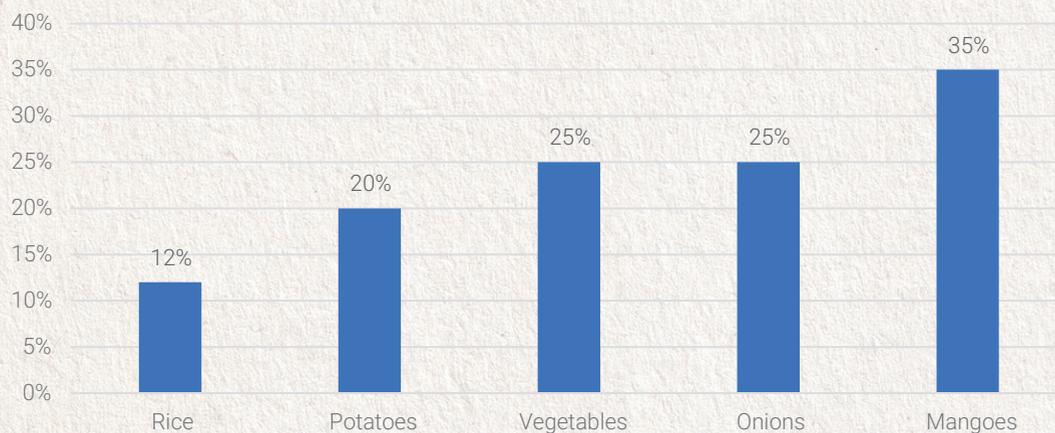


Figure 1: Post Harvest Loss Rates

4. Priority Policy Area: Transforming Extension Services

Modernizing Agricultural Extension Services

The transformation of Bangladesh's agricultural extension system represents the single most critical policy intervention for achieving sustainable agricultural development. Without effective extension services, investments in technology, mechanization, and inputs cannot reach farmers or translate into productivity gains.

4.1 Current State: A System Under Severe Strain

The Department of Agricultural Extension (DAE) serves as the primary interface between agricultural research and farmers. However, the system faces fundamental structural constraints that limit its effectiveness in driving agricultural transformation (GFRAS, 2023).

Critical Staffing Deficits

- Current farmer-to-extension worker ratios range from 1:900 to 1:2,000
- Recommended international standard: 1:400
- Achieving the recommended ratio would require recruiting 5,000+ additional workers
- Many Sub-Assistant Agriculture Officers (SAAOs) serve 2-3 blocks simultaneously

Systemic Operational Challenges

- Top-down operational model with limited farmer feedback mechanisms
- Weak research-extension linkages delay technology transfer
- Limited coordination with private sector input suppliers and service providers
- Insufficient training and professional development for field staff
- Resource constraints limiting field visits and demonstration activities

4.2 A Three-Pronged Transformation Strategy

Addressing the extension services gap requires simultaneous action across three fronts: strengthening traditional services, deploying digital solutions, and establishing farmer service centers as integrated hubs.

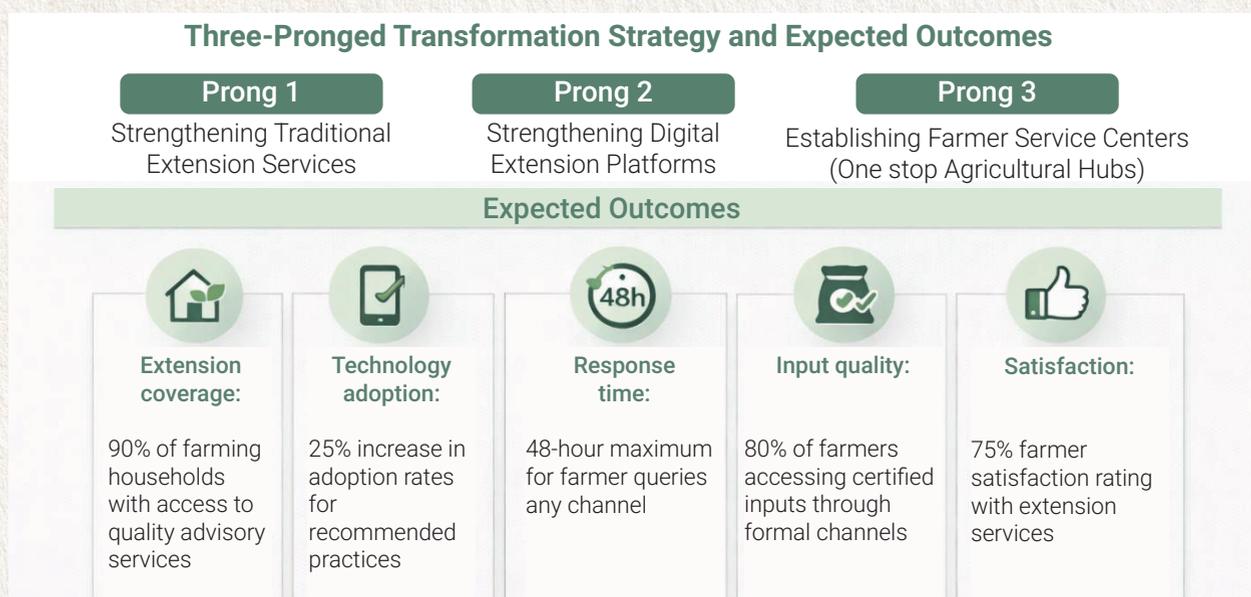


Figure 2: Three Pronged Transformation Strategy and Expected Outcomes

PRONG 1: Strengthening Traditional Extension Services

Traditional face-to-face extension remains irreplaceable for complex technology transfer, building farmer trust, and reaching populations with limited digital access.

Recommended Actions:

- Phased recruitment program to achieve 1:600 ratio by 2028, 1:400 by 2030
- Competency-based training curriculum including technical, communication, and digital skills
- Performance incentives tied to measurable adoption outcomes
- Strengthened research-extension linkages through regular joint planning sessions
- Expansion of Farmer Field Schools (FFS) for hands-on technology demonstration
- Lead Farmer programs to leverage peer-to-peer knowledge transfer

PRONG 2: Strengthen Digital Extension Platforms

Digital technologies can dramatically extend the reach and responsiveness of extension services while complementing—not replacing—human extension workers.

Digital Extension Components

- **Mobile Advisory Services:** SMS and voice-based advisories in local languages for weather alerts, pest warnings, price information, and agronomic recommendations
- **Video-Based Learning:** YouTube and local platforms for visual demonstration of technologies, reaching farmers who prefer visual learning
- **Call Centers:** Toll-free agricultural helplines staffed by subject matter specialists for real-time problem-solving
- **AI-Powered Diagnostics:** Image recognition apps for pest and disease identification with treatment recommendations
- **WhatsApp/Messaging Groups:** Community-based farmer groups for peer support and information sharing

Implementation Priorities:

- Integrate digital platforms with existing DAE management information systems
- Develop content in local dialects with attention to literacy constraints
- Establish feedback mechanisms to ensure farmer queries reach specialists
- Partner with telecom providers for reduced-cost or subsidized access
- Train extension workers as digital facilitators, not replacements

PRONG 3: Establish Farmer Service Centers (One-Stop Agricultural Hubs)

Farmer Service Centers represent a transformational model that integrates extension, inputs, credit, and market services at the upazila and union levels.

Core Services to be Provided:

- Extension advice and technology demonstrations
- Quality-certified input supply (seeds, fertilizers, crop protection)

- Soil testing and recommendation services
- Machinery custom-hiring services
- Credit facilitation through MFI/bank partnerships
- Market information and linkage services
- Digital kiosks for online advisory access
- Post-harvest handling guidance and cold storage access

Operational Model:

- Public-private partnership structure with DAE oversight
- Private sector operation of commercial services (inputs, machinery)
- Government provision of extension staff and digital infrastructure
- Revenue model based on service fees and input margins

4.3 Expected Outcomes

Measurable Impact Targets by 2030

- *Extension coverage:* 90% of farming households with access to quality advisory services
- *Technology adoption:* 25% increase in adoption rates for recommended practices
- *Response time:* 48-hour maximum for farmer queries through any channel
- *Input quality:* 80% of farmers accessing certified inputs through formal channels
- *Satisfaction:* 75% farmer satisfaction rating with extension services

5. Strategic Framework for Program Improvement



Figure 3: Five Strategic Pillars for Agricultural Transformation

5.1 Guiding Principles

- Address demand-side barriers systematically—side interventions alone will not achieve transformation
- Improve implementation quality before expanding scale—fixing delivery mechanisms is more valuable than adding targets
- Strengthen institutional coordination—multiple agencies require better harmonization
- Prioritize feasible interventions with demonstrated effectiveness over ambitious but uncertain approaches

5.2 Five Strategic Pillars

Pillar 1: Technology-Led Intensification

Focus on under-served technologies for planting, harvesting, and solar irrigation.

- Develop innovative financing mechanisms based on regional models (Thailand, Vietnam, South Korea)
- Reform agricultural credit products to align with crop cycles
- Invest in awareness campaigns demonstrating economic benefits
- Strengthen monitoring to prevent subsidy capture
- Remove or relax the three-year resale restriction

Pillar 2: Strategic Crop Diversification

- Expand parametric crop insurance to reduce adoption risk
- Prioritize cold storage development for vegetables and fruits
- Develop guaranteed procurement mechanisms for diversified crops
- Reassess policy incentives that currently favor rice over other crops

Pillar 3: Market System Development

- Scale cold storage investment substantially, prioritizing non-potato commodities
- Develop PPP models with land, policy support, and tax holidays
- Implement traceability systems, starting with export commodities
- Assess existing online B2B market platforms before establishing new ones

Pillar 4: Climate-Smart Agriculture

- Investigate reasons for low AWD adoption despite proven benefits
- Expand index-based insurance coverage
- Develop robust monitoring systems to access results-based climate finance
- Integrate seismic risk considerations into infrastructure planning

Pillar 5: Institutional Strengthening

- Prioritize extension system transformation (see Section 4)
- Strengthen research-extension linkages through institutional reform
- Improve program monitoring with field verification
- Establish coordination mechanisms across implementing agencies

6. Implementation Considerations

6.1 Institutional Coordination

Effective implementation requires improved coordination across the multiple agencies currently implementing agricultural programs. A National Agricultural Transformation Committee could provide strategic oversight, but more important is operational coordination at district and upazila levels where programs actually interface with farmers.

6.2 Monitoring and Adaptive Management

Current programs would benefit from strengthened monitoring systems that include field verification of reported outcomes. The discrepancies identified in mechanization program records suggest that output monitoring alone is insufficient—outcome verification and beneficiary feedback mechanisms are essential for adaptive management.

6.3 Financing Considerations

Substantial resources are already mobilized through existing programs. The priority is not additional resource mobilization but more effective utilization of existing resources.

Key Financing Improvements Needed

- Reform agricultural credit products to match crop cycles and farmer documentation capacity
- Reduce interest rates through risk-sharing mechanisms
- Address subsidy capture that reduces program cost-effectiveness
- Explore the shift from banks to MFIs to reach farming communities more effectively

7. Risk Considerations

Key Risks to the Transformation Agenda

- *Climate risks:* Most severe threat with annual losses estimated at US\$3 billion
- *Economic risks:* Global price volatility and fiscal constraints could reduce resource availability
- *Political and institutional risks:* Policy reversals and coordination failures
- *Technical risks:* Gap between demonstrated potential and actual adoption
- *Implementation capacity risk:* Over-ambitious targets creating perverse incentives for reporting inflation

8. Conclusion

Bangladesh has developed comprehensive policies and mobilized substantial resources for agricultural transformation. The challenge is not primarily one of policy gaps or resource constraints but of implementation effectiveness. Current programs have ambitious targets, but achieving them requires addressing the demand-side barriers, institutional coordination weaknesses, and delivery quality issues that have historically limited agricultural development efforts.

The transformation of extension services—through traditional strengthening, digital platforms, and Farmer Service Centers—represents the highest-impact intervention for agricultural development. Without effective extension, technology investments cannot reach farmers, credit programs cannot assess needs, and market linkages cannot be established. Extension modernization should be treated as the foundation upon which all other agricultural transformation efforts depend.

This strategic framework recommends focusing on improving the performance of existing programs rather than adding new initiatives. The investments already committed through various programs of the government, such as the Program on Agricultural and Rural Transformation for Nutrition, Entrepreneurship, and Resilience (PARTNER), the mechanization program, and government budgets are substantial. Ensuring these investments achieve their intended outcomes requires proper assessment of implementation challenges and willingness to adapt approaches based on evidence.

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Annex: Summary Tables

A.1 Key Implementation Gaps and Recommendations

Implementation Gap	Evidence	Recommendations
Extension services understaffed	Ratios 1:900-1:2000 vs 1:400 recommended	Three-pronged transformation: traditional, digital, service centres
Demand-side barriers unaddressed	Planting/harvesting <2% mechanized despite subsidies	Reform credit; innovative financing; awareness campaigns
Subsidy capture by intermediaries	Price inflation; field verification discrepancies	Strengthen monitoring; beneficiary verification
Cold storage potato-concentrated	95% of 450 facilities potato-only; veg losses 25-35%	Substantial non-potato investment via PPP
Low adoption of proven technologies	35% certified seed; minimal AWD adoption	Research farmer hesitancy; insurance for risk reduction

Sources: GFRAS (2023); Hossen (2019); Ministry of Agriculture (2024); Akhter, U. et al. (2024); BIDA (2024)

A.2 Extension Services Transformation: Investment Summary

Component	Investment (BDT Cr)	Timeline
Traditional Extension Strengthening	2,500	2025-2030
Digital Platform Development	800	2025-2028
Farmer Service Centre Network (public)	1,500	2025-2030
TOTAL PUBLIC INVESTMENT	4,800	5 Years

Source: Author's estimates and projections based on the budget of the PARTNER program (World Bank, 2023). These figures are indicative only.

Disclaimer: *The views expressed in this policy brief are author's own & do not reflect the views of GED or Bangladesh Planning Commission*

Acknowledgement: *We thank the participants in the stakeholder consultation meeting on this topic held on 13 January 2026, for their valuable comments and suggestions. We also thank the review committee members of GED for their valuable inputs. Finally, we gratefully acknowledge the financial support from UNICEF Bangladesh for the preparation and publication of this policy brief.*

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