

## Introduction

The journey of agricultural extension in Bangladesh began during British rule in 1870 with the establishment of the Agriculture Department under the Revenue Division (Initial Stage-1). In 1906, a separate full-fledged Agriculture Department was formed (Initial Stage-2) and in 1914, extension activities were institutionalized through demonstration farms at the district level. During 1950–1960 (Testing & Adoption Stage), extension activities accelerated through the Village Aid Program. From 1970–1976 (Fragmentation Stage), the Agriculture Department split into Education-Research and Extension-Management wings, leading to the emergence of single-crop boards.

In 1981, President Shaheed Ziaur Rahman approved the modernization of agricultural extension and an organogram with 32,000 positions for the department. To avoid delays in implementation, he wrote in green ink on the file: "**Proposals in the file are approved. No concurrence from the Ministry of Establishment or Finance is required.**" Following this, a major change occurred on 14 September 1982 (Reunification Stage). Six agencies were merged: Directorate of Agriculture (Extension & Management), Directorate of Agriculture (Jute Production), Directorate of Crop Storage, Horticulture Board, Tobacco Development Board and Central Extension Resource Development Institute, through Order No. Extension-1/ka-30/82/433, the Government of Bangladesh established the Department of Agricultural Extension (DAE).

Today, DAE plays an integrated role in food and nutrition security, climate adaptation, women's empowerment and sustainable/ safe/ profitable agriculture, elevating Bangladesh's agricultural system to unparalleled heights.

## **2. Goals & Objectives of DAE per National Agricultural Extension Policy 2020**

### **2.1.1 Vision**

Safe, sustainable, diversified and profitable agriculture.

### **2.1.2 Mission**

Climate-resilient, eco-friendly, safe, sustainable and nutritious crop production by providing demand-driven technology and information services to all classes of farmers and entrepreneurs.

## **2.2 Core Objectives**

2.2.1 Increase production, productivity and income of farmers for food grains and other agricultural products.

2.2.2 Promote crop diversification and safe/nutrition-sensitive agriculture.`

2.2.3 Develop modern, eco-friendly extension management systems resilient to natural disasters and climate change.

2.2.4 Assist farmers in farm mechanization, agricultural marketing and fair price access.

2.2.5 Expand demand-driven export-oriented processing industries, commercialize agriculture & create employment.

2.2.6 Support participatory research.

2.2.7 Institutional development, in creased ICT use and skilled human resources.

## **3. DAE's Functional Scope**

DAE operates through 8 Wings to achieve its vision, mission and goals

### **3.1 Wing Overview**

The Director General of DAE coordinates 8 Wings, which play vital roles in: technology dissemination, crop production & quality enhancement, safe agricultural production, input management, disaster management, digital extension services, market linkage & export development, climate adaptation & environmental protection and farmer socio-economic development

### **3.1.1 Administration & Finance Wing**

Budget | HR | Asset Management | Infrastructure | Coordination

- Annual budget formulation, implementation and accounting for all Wings.
- Human resource management (recruitment, promotion, transfer) and government property records.
- Vehicle management, infrastructure maintenance and workplace safety.
- Coordination and supervision of administrative activities.

### **3.1.2 Horticulture Wing**

Technology Innovation | Seed Management | Revenue

Optimization | Research Collaboration

- Research, extension and quality seed/seedling production for horticultural crops.
- Germplasm collection, validation and annual production planning.
- Revenue enhancement and infrastructure development for horticulture centers.
- Collaboration with research institutions/ universities for problem-solving.
- Coordination with private nurseries/ mushroom sectors and skill development.

### **3.1.3 Training Wing**

Training Management | Curriculum Development | Education

Board Partnership

- Staff training: Needs assessment, scheduling and implementation (domestic/ international).
- Farmer capacity building: Training coordination at district/ sub-district levels.
- Policy & curriculum: Training policies and agricultural diploma curricula.

- Coordination: Oversight with Bangladesh Technical Education Board.
- Data management: Database for trained individuals.
- Creating skilled manpower through 18 Agricultural Training Institute (ATI).

### 3.1.4 Crops Wing

Strategic Planning | Technology Dissemination | Policy Advocacy  
| High-Value Crops | Research-Extension Linkage

- Planning & monitoring: Field crop cultivation and production plans.
- Technology dissemination: Modern crop production techniques (grains, pulses, oilseeds).
- Evaluation: Adoption rate analysis.
- Policy input: Proposals for national agricultural policies.
- Productivity enhancement: High-value/ hybrid crops.
- Problem-solving: Field-level challenge identification with research institutions.

### 3.1.5 Field Services Wing

Strategic Planning | Climate Adaptation | Technology  
Dissemination | Multi-Stakeholder Coordination | Sustainable  
Production | Financial Management

- Seasonal/ annual agricultural planning and evaluation.
- Crop cultivation targets and achievement strategies.
- Field-level technology extension and input quality assurance.
- Farm mechanization and e-extension services.
- Climate risk strategies, disaster forecasting, incentives and rehabilitation.
- Sustainable crop technologies for adverse regions (coastal/ char/ hilly/ Barind).
- Linkages between research, education, markets and extension.

- Fertilizer and Pesticide management and monitoring.
- Government-NGO coordination.
- Revenue and development budget roles.

### **3.1.6 Plant Protection Wing**

Pesticide Regulation | Quality Assurance | Farmer Awareness | Research-Extension Linkage | Crop Protection

- Pesticide registration, licensing and quality control (including factory inspections).
- Eco-friendly measures like Safe pesticide production and residue monitoring.
- Awareness building through Farmer training and technology dissemination.
- Early warning and Integrated Pest Management (IPM).

### **3.1.7 Plant Quarantine Wing**

International Compliance | Phytosanitary Certification | Legal Enforcement | Coordination | Field Inspection

- International standards: Adherence to IPPC and GAP for import/export.
- Phytosanitary certification: Pre-inspection and certification for exports.
- Legal enforcement: Plant quarantine laws and biodiversity policies.
- Coordination: With quarantine centers and National Plant Protection Organization (NPPO).
- Field inspection: Quality and pest-free certification.
- 30 Quarantine stations: To prevent the spread & invention of exotic pest and diseases.

### **3.1.8 Planning, Project Implementation & ICT Wing**

International Liaison | Data-Driven Planning | Project Lifecycle Management | Digital Transformation | Infrastructure Optimization

- International coordination: Agricultural data exchange and ambassador briefings.
- Data management: Crop and technology specific databases and strategic planning.
- Project management: Feasibility studies, EIA certification, donor coordination, implementation , monitoring and evaluation.
- Digital transformation: E-extension services, website updates and digital tools.
- Infrastructure: Maintenance and modernization of facilities.

## 4. DAE's Achievements (1972–2025)

### 4.1 Increased Production Despite Reduced Arable Land

Despite losing 1.048 million hectares of farmland (10.48 lakh ha) due to urbanization and industrialization (1989: 80.226% → 2022: 72.352%), Rice production increased 3.5 times (1972–73: 10M tons → 2023–24: 38M tons), Maize: 5.64M tons (more than 21%) and mustard: 1.43M tons (more than 43%) in 2024/25. About 42% of population is employed in this sector (BBS, 2022).

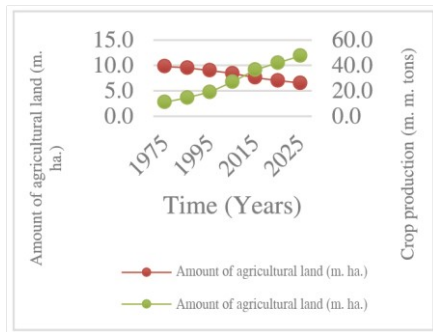


Figure 1: Post-independence reduction in agricultural land and increase in crop production.

**Drivers:** Timely modern technology, high-yielding seeds, quality fertilizers, farmers training. (source: BBS)

## 4.2 Human Resource Development

Between 1972 and 2025, the Department of Agricultural Extension (DAE) trained over 5 million farmers in modern agricultural techniques, driving significant advancements across the sector. The adoption of high-yielding crop varieties boosted productivity by 30%, while women's participation grew substantially, now constituting 36% of the agricultural labor force (approximately 18 million workers). Digital transformation played a key role, with ICT services reaching more than 2 million farmers providing real-time data on inputs and market prices. Entrepreneurship flourished as DAE initiatives fostered over 10,000 agri-entrepreneurs, catalyzing a 25% expansion in agribusiness activities. In disaster-prone regions, climate-resilient crops such as saline-tolerant rice increased production by 15%. Collectively, these efforts strengthened agriculture's economic contribution, which now accounts for 11.5% of Bangladesh's GDP with an annual growth rate of 3.5%. (Source: BBS LFS 2022)

## 4.3 DAE's Role in Nutrition Security

**Biofortified crops:** Trained more than 2 million farmers on Golden Rice (vitamin A), zinc-rich rice and high-iodine vegetables. Vitamin A deficiency has reduced nearly 15% (2023).

**Nutrition gardens:** More than 1.2 million homestead gardens meet 40% of daily nutrition for 3.5 million people. Women lead 70% of gardens.

**Awareness:** Over 50,000 courtyard meetings and 1,200 nutrition fairs reached 20 million people. School nutrition programs in 10,000+ institutions improved diets for 2.5 million children.

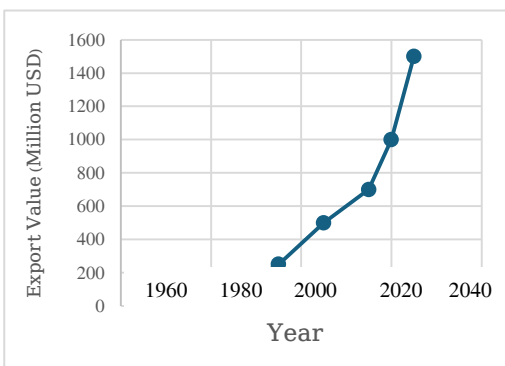
**Climate-resilient crops:** Saline-tolerant rice (BRRI Dhan 108) and flood-resistant pulses increased production by 18% on 5 lacs hectares, nourishing 2 million people.

**Synchronous cultivation:** Cultivation of 20,600 acres land in boro season (DAE, 2023).

**Result:** Child stunting reduced from 42% to 24.6% (2010–2023); maternal anemia decreased by 26%. Agricultural nutrition production rose by 60%, increasing dietary diversity index from 7.5 to 8.9.

#### 4.4 Agricultural Export Growth

Significant strides in agricultural exports have been driven by the Department of Agricultural Extension (DAE)'s targeted initiatives. Farmers received specialized training in high-yield, export-



oriented crops including mango, jackfruit, dragon fruit, vegetables, species, honey, coffee, chaschewnut and strawberry enhancing both productivity and market readiness. Stringent adherence to Good Agricultural Practices (GAP), organic certification and phytosanitary compliance unlocked access to premium markets in Europe and the Middle East.

Strategic cluster farming amplified efficiency, with dedicated zones for mango in Satkhira (10,000 hectares), rice in Naogaon (5,000 hectares) and sesame in Kurigram (2,000 hectares). Critical infrastructure upgrades, particularly in cold chain management, improved storage and packaging for perishables like mangoes, guavas and vegetables. These efforts catalyzed remarkable export growth: fruit and vegetable shipments surged from 2000–2025, with earnings rising from \$1,000 million in 2020 to a projected \$1,500 million by 2025. A standout achievement came in 2023, when mango exports alone exceeded 12,000 tons (valued at \$35

million). Collectively, these advancements have elevated Bangladesh's global competitiveness and expanded demand for its agricultural products.

#### 4.5 Reduced Pesticide Use

**Integrated Pest Management (IPM):** Trained 50K farmers (2015–2020), reducing pesticide use by 35%.

**Biopesticides:** 20–25% farmers adopted bio/natural pesticides by 2020.

**Farmer training:** Enhanced skills for 60% farmers (2010–2025).

**Annual reduction:** 3–5% (2015–2020); 4% decrease in 15 districts (2018).

**Result:** Improved soil health and sustainable agriculture.

#### 4.6 Farm Mechanization & Labor Dignity

**Mechanization coverage:** 35% of agricultural land (2023) & paradigm shift of agriculture.

**Productivity gains:**

Combine harvesters reduced rice harvesting time by 60%. Tractors/rotavators cut land preparation time by 50%. Crop yield increased by 25-30%.

**Labor impact:**

30% trained farmers increased monthly income by 30–40%. Women's participation rose by 25% (planting/ harvesting).

**Employment:** Over 150K jobs in machinery repair/ maintenance.

**Result:** Enhanced farmer income, women's participation and sustainable farming.

## 4.7 Employment in Agro-Based Industries

The period from 2010 to 2020 witnessed the creation of 1–1.5 million new jobs in agro-based industries, driven by expansion in mechanization, processing and export sectors. Key employment avenues included roles as machinery operators and maintenance technicians in farm mechanization; positions in food processing, packaging and logistics; and supply chain management careers tied to agricultural exports.

The Department of Agricultural Extension (DAE) catalyzed this growth through strategic initiatives, such as providing subsidized machinery and farmer’s capacity development, establishing a 100% locally sourced spare parts market to sustain equipment and developing integrated farm-to-fork value chains to minimize post-harvest losses.

Looking ahead, DAE aims to generate 500,000 export-focused jobs by 2025 via dedicated Agro-Export Hubs while leveraging digital platforms to empower youth and women entrepreneurs. Currently, the sector sustains an 8–10% annual increase in employment, reflecting its robust contribution to Bangladesh’s economic resilience (*Source: BBS LFS 2022, DAE reports*).

## 4.8 Crop Diversification

**Rice-centric shift:** Wheat (11.72 lakh metric ton), maize (64.31 lakh metric ton), (BBS 2023), mustard (over 35%, 2015–2023).

**Vegetables/fruits:** More than 25% vegetables (2020–2023) and 18% fruits (2023). Cultivation of more than 1500 varieties of mango and exported in 21 countries (2024). Self-sufficiency in jackfruit, pineapple, lemon.

**Spices/oilseeds:** Sesame (more than 50%), soybean (more than 20%), groundnut (250K Metric ton in 2023).

**Digital adoption:** 25–30% farmers use digital platforms; over 1M served via mobile apps/call centers.

**Strategies:**

- 500+ fairs and 1,200 demo plots for new crops.
- Promotion of high-value crops (mango, chili, coffee, cashew nut, strawberry and gerbera).
- Climate-resilient varieties (e.g., BRR1 Dhan 100).

**Result:** 12% land optimized; enhanced climate resilience.

## 4.9 Transition to Commercial Agriculture

**Market-based production:** Vegetables/fruits +30% (2020–2023); 25% farmers grow high-value crops.

**Mechanization:** 520K tractors and 180K harvesters, 300 service centers and 5500 skilled manpower boosted productivity by 25% and cut costs by 20%.

**Processing/exports:** More than 500 processing units; exports over 15% (2023); mushrooms/flowers earned approximately 1 billion BDT (2022–23).

**Credit access:** 20% of farmers use commercial loans (2023).

**Strategies:**

- Trained 1M+ farmers in market analysis and modern farming.
- Crop diversification (rice, maize, soybean, pulse, vegetables mustard, sunflower).
- Digital market access for more than 1.5 million farmers.

## 4.10 High-Value Fruit & Crop Production

**Fruits:**

- Dragon fruit: 50 ha (2010) → 2,000 ha (2023).
- Strawberry: increase growth (currently 1,200 ha).

- Mulberry, passion fruit, wood apple, avocado, rambutan, rockmelon expanded to more than 30 districts; Indian gooseberry more than 15%.

**Crops:**

- Quinoa: 800 ha (2023) from trial cultivation (2018).
- Black rice: 4 times higher growth (500 ha).
- Barley/millet: More than 20% (health demand).
- Spices: Nigella, cumin, ginger +25%.

**Technology:**

- Drip irrigation/organic fertilizer training for more than 50K farmers.
- Over 200 demo plots and mobile apps for real-time advice.

**Market development:**

- Domestic demand: Dragon fruit/strawberry market development.
- Exports: 500 metric ton dragon fruit to Middle East (BDT 200 million); strawberry certification for EU. Annual growth: 15%.

**4.11 Organic Fertilizer Production & Soil Health**

**Production:** 1 million tons (2010) → 2.5 million tons (2023); 800 community-based centers.

**Adoption:** 30% farmland (2010: 5–7%); 45% vegetable farmers use organic fertilizer (partial/full).

**Environmental impact:** Chemical fertilizer use around 20%; soil organic matter approx. 1.2% → 2.5%.

**Strategies:**

- Trained 1.5M farmers (vermicompost/green manure).
- Subsidies per 2008 "Organic Fertilizer Policy".
- Over 5,000 demo plots.

**Result:**

Soil fertility, water retention and farmer income around 30–35%.

**4.12 GAP Implementation for Safe Crop Production**

Launched Bangladesh GAP Framework (2015) to ensure safe crop production. The guideline was published in 2017 and field-level training began in 2018.

**Achievements:**

- 100 safe production zones by 2020.
- GAP-compliant crops: 8–10% of total agri-production (2018: 50K MT → 2025: 400K MT).
- Target crops: Tomato, cucumber, guava, litchi, mango, rice.

**Impact:** Enhanced farmer skills, crop quality and export potential.

**4.13 Global Ranking of Bangladesh’s Top Agricultural Products (FAO, 2021)**

Product	Global Rank	Key Facts
Jute	2nd	Second-largest producer after India.
Chili (dried)	2nd	Surpassed China and Thailand.
Rice (paddy)	3rd	Overtook Indonesia (2020).
Vegetables	3rd	Exported in 50 countries.
Potato	7th	Production: 9.8 million tons (2021).
Mango	9th	Significant production/export potential

**Success drivers:** High-yield varieties, mechanization, government support, irrigation/fertilizer systems.

## 5. Future Challenges & Way Forward

### 5.1 Reduction of Agricultural Land, Land Tenure System and Management of Khas Land

According to agricultural censuses, the number of farming households in Bangladesh increased from 26 million in 1996 to 36 million in 2019, reflecting a 38% growth over 23 years. Consequently, food demand has increased significantly, while the country's agricultural land has been decreasing at an average annual rate of 0.19%. For instance, in 2008, the net cultivable land was 19 million acres, which decreased by 2% (416,000 acres) to 18.6 million acres in 2019 (Fig.: 1). This has resulted in a significant rise in landless households.

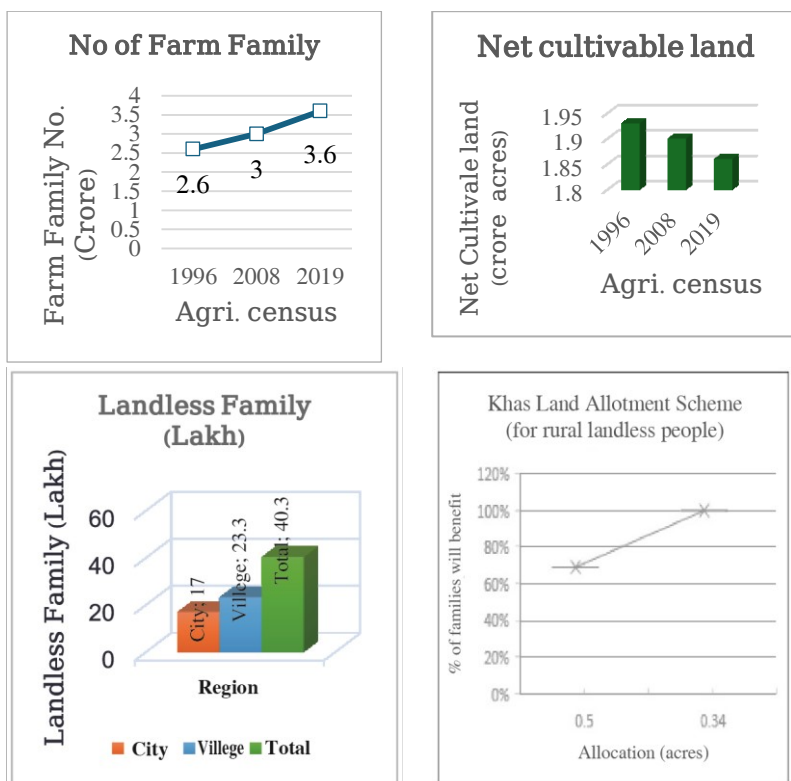


Figure 1: Number of agricultural households, cultivable land and landlessness rate

According to the 2019 Agricultural Census, fully landless households account for 28.79% (approx. 1.7 million) in urban areas and 7.86% (approx. 2.33 million) in rural areas, totaling 11.33% (approx. 4.03 million) nationwide. Allocating khas land to these landless and ultra-poor households for cultivation can ensure sustainable agricultural production.

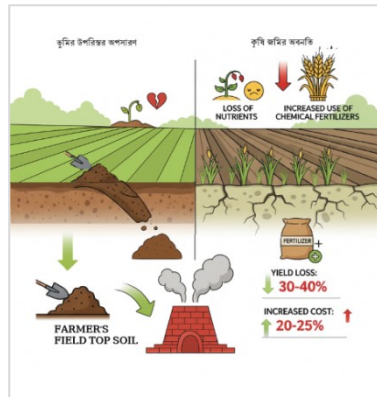
Bangladesh has approximately 3.3 million acres (1.335 million hectares) of khas land, including 0.8 million acres of agricultural khas, 1.7 million acres of non-agricultural khas and 0.8 million acres of khas water bodies. In principle, khas land can be leased for 99 years, typically 1–3 acres per landless or ultra-poor household. If agricultural khas land is distributed among rural landless households at 0.5 acres per household, about 69% would benefit. Allocating 0.34 acres per household would allow 100% of rural landless households to cultivate food grains, vegetables, pulses and fruits, significantly reducing household food expenses and market dependence. This approach ensures both food security and social justice. Assigning the Department of Agricultural Extension (DAE) responsibility for managing agricultural khas land could bring a revolutionary change in the country's production system.

## **5.2 Top Soil Removal and Agricultural Land Degradation**

Top Soil removal in Bangladesh has become a severe environmental and agricultural crisis. Research indicates that approximately 3,350 million cubic feet (~60 million tons) of fertile topsoil is removed annually for use in ~7,000 brick kilns, posing a serious threat to agriculture and the environment (Soil Research and Development Institute, 2023; Department of Environment, 2022). This removes 85–90% of organic matter and 60–70% of nitrogen, phosphorus, sulfur, potassium and micronutrients, causing 15–25% yield reduction, 5–7% of land becoming permanently uncultivable and 8–12 feet deep holes that weaken riverbanks, increase flood risk and increase farmers' dependence on chemical fertilizers.

Farmers must apply an additional 12,000–15,000 BDT worth of fertilizer per hectare to replenish nutrients. Nationally, this translates to 150,000 hectares requiring an extra 30–37.5 thousand tons of urea, 12–15 thousand tons of TSP and 18–22.5 thousand tons of MoP annually, costing the economy 1,800–2,250 crore BDT. This increases production costs by 30–40%, reduces profitability, undermines agricultural sustainability and diminishes soil carbon storage, exacerbating climate risks.

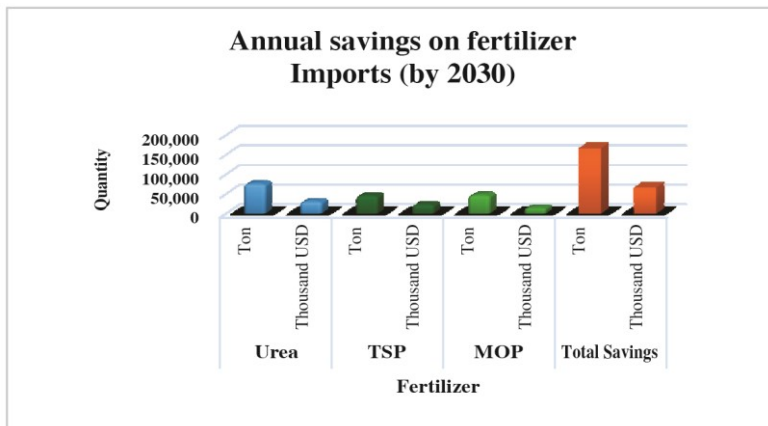
Solutions include strict implementation of the Brickmaking and Brick Field (Control) Act 2019, using environmentally friendly technologies and farmer training on topsoil conservation. DAE plans to train 50,000 farmers, promote green fertilizers and compost use and conduct awareness programs by 2030. The goal is a 50% reduction in topsoil removal and 20% recovery of degraded land by 2030, ensuring sustainable agricultural productivity and food security.



### 5.3 Solid Waste Mismanagement, Environmental Pollution and Reduced Crop Productivity Challenge

Bangladesh generates 23,700 tons of solid waste daily (22.4 million tons annually), 60–80% of which is organic. Only 55–60% of urban waste is collected and composting capacity is below 40% without source segregation (World Bank, 2023; Waste Concern, 2022; BARC Survey, 2023).

**Solution:** Strengthen waste collection through DAE-led projects, expand composting infrastructure, enforce N:P:K ratio standards for compost, provide farmer training and awareness and improve affordable transport for fertilizers. This will increase crop productivity while saving foreign exchange on fertilizer imports.



**Target:** By 2030, convert 50% of organic waste (9,480 tons/day) into compost, saving:

- Urea: 75,217 tons (30.09 million USD)
  - TSP: 45,130 tons (22.57 million USD)
  - MOP: 46,133 tons (13.84 million USD)
- Total savings: 66.5 million USD (~7,000 crore BDT) (FAO, 2023; World Bank Price Index).

### 5.4 Manure Mismanagement, Environmental Pollution and Fertilizer Loss Challenge

Bangladesh produces 0.3–0.44 million tons of livestock manure daily (110–160 million tons annually). Over 95% is mismanaged, emitting methane (12% of agriculture’s GHGs), contaminating groundwater and reducing fertilizer potential (Department of Livestock, 2023; IPCC, 2019).



**Solution:** DAE-led projects will establish large compost/biogas plants by 2030, ensure N:P:K standards for compost/bioslurry, train

farmers in organic fertilizer management and provide subsidies for biogas units and compost production.

**Target:** By 2030, convert 50% of manure (0.185 million tons/day) to compost/bioslurry (0.15–0.17 million tons/day) and biogas (3.5–4.5 million m<sup>3</sup>/day), saving on fertilizer imports:

- Urea: 690,000 tons/year (276 million USD)
- TSP: 345,000 tons/year (172.5 million USD)
- MOP: 529,000 tons/year (158.7 million USD)

**Total savings:** 607.2 million USD. Greenhouse gas reduction: 54.6 million tons CO<sub>2</sub>-eq/year (FAO; IPCC; Biogas Consortium Studies).

## 5.5 Coconut Cultivation and Windbreaks on Coastal Fallow/Uncultivated Land Challenge

In southern coastal districts (Khulna, Bagerhat, Satkhira, Barguna, Patuakhali, Bhola), salinity, waterlogging and cyclones leave 400,000–450,000 hectares uncultivated annually (Soil Fertility Survey, BARC 2023; Coastal Development Board, 2022). This reduces food security, nutrition and farmer income. Cyclones damage 35–40% of coastal housing and weak natural windbreaks increase risk to life and agriculture.

**Solution:** Expand coconut cultivation on fallow land to make land productive and create natural windbreaks. Coconut trees tolerate salinity and wind, providing long-term income and nutrition. From 2025–2035, DAE will cultivate 250,000 hectares of coconut in 15 coastal districts, establishing windbreak belts along homes, roads, canals and embankments. Farmer cooperatives and semi-processed coconut products (copra, milk, oil) will generate local entrepreneurship. BARI & BARC-developed salt-tolerant varieties and regular training will enhance sustainability.

**Target:** By 2035, produce 20–25 billion coconuts annually from 250,000 hectares, benefiting 2 million farmer households, reducing cyclone damage by 20–25%, saving 20–30% of edible oil imports and generating 300–400 million USD annually through exports.

## 5.6 Coffee Production & Export Global Context

Coffee is one of the world's most popular beverages, with ~10 million tons annual production and ~30 billion USD market.

**Domestic Status:** Bangladesh cultivate 1,800 hectares, producing 70–80 tons, while importing approximately 2,200 tons annually worth 800–900 crore BDT (90% instant coffee).

**Potential:** Nearly all regions can grow coffee, especially hilly areas and tea gardens. Expanding to 40,000 hectares could yield approximately 100,000 tons.

**Goal:** Meet domestic demand and earn foreign exchange via exports.

**Required Actions:** Expand modern varieties and technologies, establish processing infrastructure, train human resources and improve marketing, requiring around 150 crore BDT investment.

## 5.7 Cashew Production & Export Global Context

Cashew is a leading nut crop, with approximately 3.9 million tons annual production and approximately 9.8 billion USD market.

**Domestic Status:** 4,500 hectares produce approximately 2,700 tons. Annual import of 2,000–2,200 tons (approximately 600–700 crore BDT) is required; domestic production meets only 10% of demand.

**Potential:** 30,000 hectares of fallow hilly land could produce approximately 100,000 tons.

**Goal:** Fulfill domestic demand and increase export earnings.

**Required Actions:** Expand improved varieties and technologies, build skilled human resources, support entrepreneurs, develop marketing, requiring ~350 crore BDT investment.

## 5.8 Mushroom Production & Export Domestic Demand

Bangladesh's 170 million population requires around 1.551 million metric tons mushroom per year. If only 10% consume regularly, daily demand is nearly 450 MT. Mushrooms provide health benefits (tumor prevention, blood pressure, diabetes).

**Current Production:** 40–42 thousand MT/year; primarily oyster mushrooms, plus black/king/milky varieties. Market value approximately 800 crore BDT (~65.8 million USD).

**Potential & Expansion:** Meeting local demand via cultivation and processing could raise market value to 115 million USD by 2030–2033.

**Target:** Fulfill domestic demand, expand processed mushroom production and earn foreign exchange.

**Required Actions:** Expand improved varieties & technologies, develop skilled workforce, establish modern processing facilities, improve marketing and raise health awareness.

## 5.9 Climate Change & Adaptation Challenge

Bangladesh is highly climate-vulnerable; floods, cyclones, sea-level rise and salinity threaten agriculture and food security. Average temperature has risen ~1.2°C in 50 years, affecting crop yields, soil fertility and farmer income. Floods, drought and increased salinity reduce agricultural production (BMD, 2023; IPCC, 2022).



**Solution:** DAE and research institutions promote climate adaptation: salt-tolerant varieties, water harvesting, drainage

management, semi-mechanized cultivation, crop rotation and farmer training.

**Target:** By 2030, 70% of farmers in coastal and flood-prone areas adopt adaptation technologies, increase soil fertility and productivity by 20–25%, reduce crop loss risk and strengthen food security.

**Required Actions:** High-quality weather forecasts, climate-agriculture information services, community-based adaptation programs, investment in farmer cooperatives and expansion of innovative research & technology.

## 5.10 Mechanization and Custom Hiring Centers

### **Challenge:**

Bangladesh has about 16.5 million farming households and nearly 14.3 million hectares of cultivable land. Traditional farming is still labor-intensive, leading to high production costs and low efficiency. Shortage of agricultural labor during peak seasons increases vulnerability, while small and medium-scale farmers struggle to afford modern machinery. Without mechanization, crop losses remain high and productivity stagnates.

### **Solution:**

Introducing technology-based, app-driven Custom Hiring Centers (CHCs) will make modern machinery (power tillers, harvesters, seeders, threshers) available to farmers on a rental basis. This shared-access model reduces the burden of high upfront investment, ensures optimal machine utilization and encourages smallholders to adopt mechanization. Evidence from pilot CHC models in India and Bangladesh shows 15–20% reduction in labor costs and 20–25% increase in productivity. Support from the Government of Bangladesh alongside development partners (IDA, IFAD, FAO) will ensure financial sustainability and scaling.

### **Target:**

By 2030, establish at least one CHC in every upazila and union. This will ensure farmers can rent machinery locally, reduce labor dependency by 30% and increase average productivity by 20–

25%. By 2030, at least 70% of farmers should have access to mechanized services through CHCs.

**Required Action:**

Develop app-based platforms linking farmers with nearby CHCs, supported by subsidies and soft loans for establishment. Foster partnerships with private investors and NGOs, while providing training for farmers and entrepreneurs on machinery use and maintenance. A district- and upazila-level monitoring system will ensure fair pricing, quality service and broad farmer coverage.

### 5.11 Farmer Smart Card (KSC) and Farmer Smart App

**Challenge:** Bangladesh’s subsidy distribution system often suffers from inefficiency and leakage, with marginal farmers missing out. Farmers lack integrated access to land records, crop-specific guidance, financial services, weather forecasts and training resources. Without digitization, targeting support becomes difficult and transaction costs remain high. Currently, fewer than 10% of farmers have digital financial inclusion in agricultural support programs.

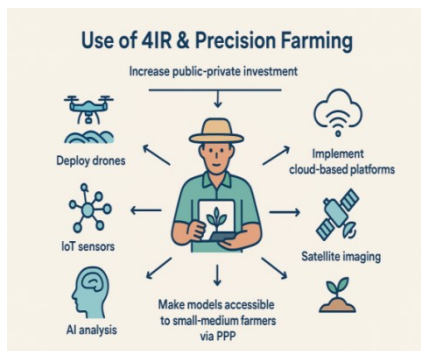
**Solution:** The Krishok Smart Card (KSC) and Smart App will create a unique digital identity for each farmer, integrating farmland size, crop data, subsidy eligibility and access to training and extension services. Through the app, farmers can receive real-time weather forecasts, market price updates, equipment rental options and financial services. By adopting international security standards (PCI-DSS, ISO-27001) and EMV chip cards, data safety will be ensured. Evidence from India’s PM-Kisan scheme shows that digital farmer ID systems significantly reduce subsidy leakage and improve targeting efficiency by 25–30%.

**Target:** By 2028, the Smart Card and App program aims to cover at least 20 million farmers, reducing production costs by 15–20%, increasing mechanization adoption from 50% to 70%, integrating 50% of young farmers and agri-entrepreneurs into digital platforms and achieving 100% transparency in subsidy distribution.

**Required Action:** To realize this, nationwide farmer data will be collected and verified to build a secure digital registry. EMV chip-enabled smart cards will be issued and linked with MFS and banking systems. Digital services-including subsidy transfers, market linkages and training-will be expanded, with data securely stored in private clouds compliant with PCI-DSS and ISO-27001. District- and upazila-level monitoring committees will oversee real-time implementation and farmer training, ensuring seamless integration with Custom Hiring Centers and agricultural extension services.

### 5.12 Use of 4IR & Precision Farming Challenge

Barriers include high initial cost, lack of technical skills and limited access for small-medium farmers, poor digital infrastructure, unstable internet, data security and poor public-private coordination.



**Solution:** Increase public-private investment, deploy drones, IoT sensors, satellite imaging, AI analysis, train farmers, implement cloud-based platforms and make precision farming models accessible to small-medium farmers via PPP.

**Target:** By 2035, maximize precision farming adoption, increase small-medium farmer productivity, reduce crop loss and enhance efficiency & sustainability.

### 5.1.13. Extension Research & Technology Dissemination Challenge

Research-extension coordination is weak; findings reach farmers late. Extension staff are limited, with insufficient training and technical knowledge.

**Solution:** Integrate all agricultural universities, research centers and DAE units; use digital extension methods (smart apps, e-vouchers, data-based services); implement demo plots, training, video content and local coordinators.

**Target:** By 2035, increase agricultural productivity by 30-40% and inform at least 10 million farmers about modern techniques and improved varieties.

### 5.14 Community Seed Bank, Field Gene Bank and Germplasm Center

**Challenge:** Local and indigenous seed varieties are rapidly disappearing due to climate change, market dependence and the widespread use of hybrid seeds. As a result, farmers are losing access to seed diversity, creating significant risks for conserving climate-resilient, high-yielding and nutrient-rich varieties.

**Solution:** Community Seed Banks will be established at the local level to provide farmers with quality and indigenous seeds. Field Gene Banks and Germplasm Centers will be developed at research institutions to conserve and improve nearly extinct local varieties. The Smart Card and App system will facilitate seed exchange, storage and demand-related information for farmers. Additionally, training programs and demo plots will teach farmers effective seed production, conservation and utilization techniques.

**Target:** By 2030, at least one Community Seed Bank will be established in every district, over 200 local/indigenous varieties will be conserved and 50% of farmers will achieve seed self-

sufficiency. Climate-resilient and nutrient-rich varieties will be made widely available to ensure sustainable agricultural production.

### 5.15 Agricultural Transformation & Farmer Protection

**Challenge:** Farmers face financial risks due to climate change, disasters, unstable market condition and high production costs; mechanization & modern technology adoption are limited, reducing productivity.

**Solution:** Reduce risks via digital agriculture, precision farming, custom hiring centers and smart cards; provide insurance, credit, subsidies, weather & market information; enhance training, technology adoption and smart apps.

**Target:** By 2035, increase farmer income by 30–40%, reduce risks, strengthen food security and implement sustainable agricultural transformation.

## Information Source

Topic	Source
Agricultural land (2022)	BBS 2022
Rice production (2022–23)	BBS/FAO 2022–23
Maize production (2021–22)	BBS 2021–22
Mustard production (2021–22)	BBS 2021–22
Women in ag labor force	BBS LFS 2022
Ag GDP share (2022–23)	BBS 2023
Child stunting (2022)	BDHS 2022
Maternal anemia (2022)	BDHS 2022
Mechanization (2022)	DAE/BBS 2022
Farmers trained in machinery	DAE 2022
Agro-industry jobs (2020)	BBS LFS 2022
Wheat area trend	BBS 2022
Maize area (2021–22)	BBS 2021–22
Mustard growth (2015–23)	BBS
Veg. prod. growth (2020–23)	BBS
Fruit prod. growth (2019–23)	BBS
Sesame growth	BBS
Soybean growth	BBS
Groundnut prods. (2021–22)	BBS 2021–22
High-value crop farmers	DAE
Tractors (2022)	DAE 2022
Harvesters (2022)	DAE 2022
Mushroom/flower export (2023)	EPB 2022–23
Farmers with loans	Bangladesh Bank
Dragon fruit area (2022)	BBS 2022
Strawberry area (2022)	DAE 2022
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