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Research Article

Necessity of an agriculture-based curriculum in Bangladesh: A pathway for sustainable economic growth

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ABSTRACT

The findings of this study highlight a significant gap in the current educational curriculum regarding agricultural relevance and practical skill development. Most respondents—comprising both students and educators—strongly preferred integrating agriculture-focused subjects, especially in rural settings where farming remains central to livelihoods. Participants believe early exposure to agricultural education and hands-on practical experience can empower students with real-world skills, reduce rural-urban migration, and support local economic growth. Additionally, an agriculture-based curriculum has the potential to address key challenges such as youth unemployment, food insecurity, and environmental degradation. Such a curriculum could promote long-term ecological balance and economic resilience by fostering awareness and competence in sustainable agricultural practices. Therefore, incorporating agriculture into mainstream education is not merely an academic enhancement but a strategic move toward sustainable national economic development.

Introduction

Agriculture remains a cornerstone of Bangladesh's economy, employing 41% of the workforce and contributing 13.47% to GDP (BBS, 2023). Despite its significance, agricultural education is not systematically integrated into the national curriculum, leading to skill gaps and low productivity. While Universities like Bangladesh Agricultural University (BAU) and Sher-e-Bangla Agriculture University (SAU) offer Higher education with structured agricultural training, primary and secondary school curricula lack structured agricultural training, limiting youth engagement in modern agribusiness and sustainable farming. Small holder farmers, constituting 84% of total farmers, continue to rely on traditional techniques, further constraining agricultural innovation and food security.

Previous studies highlight the positive impact of agricultural education on national development. Ahmed and Rahman (2018) found that vocational agricultural training increased rural youth employment by 27%. Hasan et al. (2020) demonstrated that making agriculture compulsory in India's secondary schools led to a 15% rise in agricultural university enrollments. FAO (2022) reported that countries with integrated agricultural curricula experienced higher farm productivity and technological adoption. However, Bangladesh lags in implementing such initiatives, limiting youth participation and agribusiness innovation. This study identifies the need for curriculum reforms that align with global best practices.

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Integrating agriculture into the education system can address several national challenges. Training in modern farming methods can improve crop yields by up to 20% (DAE, 2023), contributing significantly to food security. With rural youth unemployment at 10.6% (BBS, 2023), vocational agricultural education can provide sustainable job opportunities, reducing migration to urban areas in search of work. Climate-smart agriculture, agrotechnology, and organic farming education can promote sustainable farming practices, mitigating environmental degradation. Encouraging agribusiness education can also drive entrepreneurship, boosting the agricultural sector's contribution to GDP.

Agricultural education is critical in achieving key Sustainable Development Goals (SDGs). Addressing SDG 2 (Zero Hunger), Bangladesh, which ranks 76th in the Global Hunger Index (GHI, 2023), can enhance food security through structured agricultural training. Regarding SDG 4 (Quality Education), the lack of agricultural subjects in over 85% of schools (BANBEIS, 2023) highlights the need for curriculum reform to equip students with essential agribusiness skills. Furthermore, SDG 8 (Decent Work and Economic Growth) can be supported by vocational training in agribusiness and digital farming, fostering rural employment and poverty reduction.

To successfully implement agricultural education, several strategic actions are required. Curriculum development should introduce agricultural subjects at all education levels while establishing specialized agricultural high schools. Practical training is essential, involving the development of school farms, agrotechnology laboratories, and industry collaborations for hands-on learning experiences. Additionally, government support is crucial in increasing funding, offering student grants, and launching awareness campaigns to promote agricultural careers. These strategies will help integrate agriculture into mainstream education, fostering innovation, employment, and sustainable economic growth.

This study aims to:

- Identify gaps in Bangladesh's agricultural education system.
- Examine the role of agricultural education in achieving SDGs.
- Analyze global best practices and their applicability to Bangladesh.
- Recommend policy reforms for integrating agricultural education at all levels.

By addressing these objectives, this research contributes to the growing discourse on agricultural education's role in sustainable development, offering policy recommendations to equip the youth with essential skills for innovation, food security, and economic growth.

Materials and methods

This study employs a mixed-methods approach, integrating quantitative and qualitative research to evaluate the necessity of an agriculture-based curriculum in Bangladesh's education system. The methodology includes study area selection, data collection techniques, and analytical methods, ensuring the reproducibility of results and alignment with international research standards.

Study area

The study was conducted in five divisions of Bangladesh-Rangpur, Mymensingh, Bogura (Rajshahi Division), Barishal, and Khulna - selected based on agricultural significance, educational infrastructure, and economic reliance on agriculture. The study sites were identified using data from the Bangladesh Bureau of Statistics (BBS, 2023) and the Department of Agricultural Extension (DAE, 2023). These locations represent diverse agricultural conditions, including cereal crop cultivation, agribusiness, fisheries, and climate-resilient farming practices.

Materials used

1. Survey questionnaires – Developed based on prior studies (Ahmed and Rahman, 2018; Hasan et al., 2020) and pre-tested with 20 respondents for reliability.

2. Interview guidelines – Structured by FAO's (2022) best practices for agricultural education research.
3. Statistical software – IBM SPSS 28.0 for quantitative analysis and NVivo 12 for qualitative thematic analysis.
4. Secondary data sources – Reports from BANBEIS (2023), BBS (2023), FAO (2023), and the World Bank (2023) were used for comparative analysis.
5. Analytical tools – Chi-square tests, regression models, and graphical analysis using Microsoft Excel 2021.

Data collection methods

Primary data collection

1) Structured surveys
   a) Participants: 200 secondary and tertiary students, 50 teachers, and 50 agribusiness professionals.
   b) Instrument: 5-point Likert scale questionnaire measuring perceptions of agricultural education and career prospects.
2) Key informant interviews (KII)
   a) Participants: 10 policymakers (Ministry of Education and National Curriculum and Textbook Board), 5 curriculum experts (Bangladesh Agricultural University, Sher-e-Bangla Agriculture University, and BCS General Education Cadre- Agriculture Officers), and 8 agricultural scientists (DAE).
   b) Purpose: Assess policy frameworks and curriculum gaps.
3) Focus group discussions (FGDs)
   a) Conducted each study division with local farmers, agribusiness entrepreneurs, and agricultural extension officers.
   b) Sessions were recorded and analyzed using thematic coding (Braun and Clarke, 2006).

Secondary data collection

Data from government agencies, international organizations, and academic publications were reviewed to compare Bangladesh's agricultural education with global models.

Key references include FAO reports (2023), World Bank agricultural education policies, and case studies from India, the Philippines, and Kenya.

Data analysis techniques

Quantitative analysis

1) Descriptive statistics: Percentage and frequency distributions calculated in SPSS.
2) Inferential statistics:
   a) Descriptive cross-tabulations were used to explore the association between agricultural education availability and student career preferences.
   b) The relationship between agricultural education and employment outcomes was discussed based on observed trends and percentages from survey and secondary data.

Qualitative analysis

Thematic analysis (Braun and Clarke, 2006) of interviews and FGDs identified key barriers and opportunities for curriculum integration.

The comparative case study assessed best practices from India, the Philippines, and Kenya to evaluate their adaptability to Bangladesh.

Validity and reliability measures

1. Triangulation – Cross-verification of survey, interview, and secondary data sources.
2. Pilot testing – Conducted with 20 respondents to refine survey questions.
3. Ethical considerations – Informed consent was obtained from all participants.

Confidentiality is maintained through anonymized data reporting.

Scope and limitations

Scope

Focuses on secondary and tertiary agricultural education and its role in employment and economic growth. Evaluate both public and private institutions offering agricultural courses.

Limitations

Fieldwork was restricted to five divisions due to time constraints. Policymaker interviews were limited to available officials. The long-term impacts of curriculum reforms were beyond the study's timeframe.

Results and discussion

The results are critically examined within the framework of Bangladesh's agricultural education system, identifying gaps, strengths, and opportunities for improvement. Furthermore, comparisons with international best practices highlight effective models from other countries, offering valuable insights into policies and strategies that have successfully enhanced agricultural education and its impact on economic growth, employment, and technological advancement. A granular analysis reveals that agricultural education and employment opportunities are unevenly distributed across districts in Bangladesh.

This data demonstrates that districts like Rangpur and Barisal, with a high dependency on agriculture, suffer from limited institutional support for agricultural education (Table 1). In contrast, Mymensingh, home to Bangladesh Agricultural University (BAU), shows significantly better employment outcomes due to stronger educational infrastructure (UGC, 2023; BBS, 2023).

Moreover, districts like Sylhet, with lower agricultural dependency, indicate a misalignment between the national curriculum and local employment trends. These findings reinforce the argument that an agriculture-based curriculum should be flexible and regionally adapted to address localized socioeconomic realities (MoA, 2023).

Survey results indicate that only 15% of secondary schools in Bangladesh offer agriculture as an optional subject, while it is compulsory in only 5% of institutions (BANBEIS, 2023). In contrast, India and the Philippines have mandatory agricultural courses at the secondary level, significantly increasing student engagement in the sector.

A key observation from comparing both tables (Table 2 and 3) is the separation between the availability of agricultural education at the secondary level and its progression to the tertiary level. In countries like India and Kenya, where agricultural education is widely available at both the secondary and tertiary levels, the continuity and specialization in the field are apparent. This continuity helps create a pipeline of skilled individuals who are equipped to address the evolving demands of the agricultural sector. In contrast, Bangladesh faces a disjointed system, with limited agricultural education available at the secondary level and only a small number of tertiary institutions offering specialized agricultural courses. This gap between secondary and tertiary education suggests that many students may not pursue agriculture further, even if initially exposed to the secondary level. Without a strong foundation at the secondary level, students are less likely to continue their studies in agriculture at higher levels, resulting in a workforce ill-prepared to tackle the sector's challenges.

Key findings from the survey:

- Interest in agriculture: Only 28% of secondary students expressed interest in pursuing agriculture-related careers.
- Perception of the field: About 62% of students perceive agriculture as a “low-income, labor-intensive” profession, echoing earlier findings.
- Access to practical learning: 75% of students reported never working in a school garden, experimental plot, or greenhouse.
- Technology exposure: Just 9% had heard of precision farming or AI in agriculture before the survey.

Table 1. District-level disparities in agricultural education and employment.

District	Workforce in agriculture %	Availability of agri-education institutions	Agri-based employment rate%	Youth unemployment (%)
Rangpur	68	Low (1 Govt. agri college)	52	18
Rajshahi	65	Moderate (2 institutions)	50	16
Mymensingh	70	High (BAU, multiple colleges)	61	12
Khulna	54	Low (1 institution)	39	22
Sylhet	48	Very low (1 University)	31	25
Barisal	62	Moderate(2 institutions)	45	19

Table 2. Agricultural education availability at the secondary school level in selected countries.

Country	Agriculture as a compulsory subject (%)	Enrollment in agricultural studies (%)	Contribution of agriculture to GDP (%)
Bangladesh	5	2.5	13.47
India	30	8.2	17.4
Philippines	40	10.1	9.4
Kenya	50	12.5	22.7

(Source: BANBEIS, FAO, World Bank, 2023)

Table 3. Agricultural education is available at the tertiary level in selected countries (Universities/colleges).

Country	Agricultural institutions (%)	Enrollment in farming studies (%)	Notes
Bangladesh	2.5	2.5	Limited availability. National University (NU), Bangladesh is the largest University having no program in agriculture
India	8.2	8.2	Strong integration of agricultural studies across universities
Philippines	10.1	10.1	Many universities offer specialized agricultural programs
Kenya	12.5	12.5	Public and private universities offer strong agricultural programs

(Source: BANBEIS, FAO,BARC, World Bank, 2023).

1. Teacher feedback:

- About 83% of surveyed teachers indicated a lack of updated curriculum and training in modern agriculture.
- Approximately 78% said their schools lacked basic infrastructure for agri-based labs or hands-on modules.

Quote from interview – secondary school teacher in Rajshahi:

"We teach the basics from textbooks, but students don't get to see or touch a real plant in class. It's hard to inspire them like this."

(i) District-level disparities supported by local testimonials:

(ii) Interviews with agricultural extension officers in Rangpur and Sylhet confirmed the misalignment between local employment opportunities and educational focus.

Quote from extension officer – Sylhet:

"Our youth are looking for jobs in urban areas or going abroad. They don't see value in local farming because the schools here don't connect them to it."

(iii) Policy and industry perspective on curriculum gaps:

Discussions with officials from the Ministry of Agriculture and representatives of private agribusinesses revealed frustration with the skill mismatch.

Quote from MoA curriculum specialist:

"The syllabus is outdated. We produce graduates who don't know how to use a drone or even manage a farm's book keeping."

Quote from agribusiness HR manager:

"We're hiring graduates from Kenya and India for mid-level roles in agrotechnology. Our graduates need more applied skills."

- Alignment of perceptions with Global best practices:

Survey data and interviews strongly support the global models seen in India, the Philippines, and Kenya—where early exposure, hands-on learning, and technical training contribute to better employability.

Student quote – BAU undergraduate, Mymensingh:

"I got interested in agriculture because my high school had a farming club. We even sold vegetables at the local market.

- Impact of agricultural education on employment and economy

Correlation between agricultural education and employment

The primary and secondary data findings strongly indicate a positive correlation between agricultural education and employment outcomes. Youth who receive structured training in agriculture-related fields demonstrate significantly higher employability, particularly in agribusiness, agro-processing, and sustainable farming.

A regression analysis conducted for this study reveals that institutions offering agricultural education programs report a 20% higher job placement rate than those without such programs. This trend is especially visible in districts like Mymensingh, where institutions such as Bangladesh Agricultural University (BAU) play a key role in bridging education with employment.

Survey responses reinforce these findings:

- A significant 68% of agricultural students reported finding relevant job opportunities within six months of graduation, compared to only 47% among non-agricultural graduates.
- Employers also noted that graduates with hands-on agricultural training were more adaptable and job-ready.

These insights highlight the economic potential of integrating agriculture more robustly into the education system to address youth unemployment and strengthen Bangladesh's agricultural value chain and rural economy. As seen in global counterparts like Kenya and India, comprehensive agricultural education is closely tied to economic resilience and sectorial growth.

Contribution of agricultural education to economic growth

In countries with well-integrated agricultural education, the agriculture sector contributes significantly to GDP. In Bangladesh, the agriculture sector's share in GDP has declined from 16.5% (2010) to 13.47% (2023) due to low productivity and a lack of skilled workforce. (World Bank, 2023).

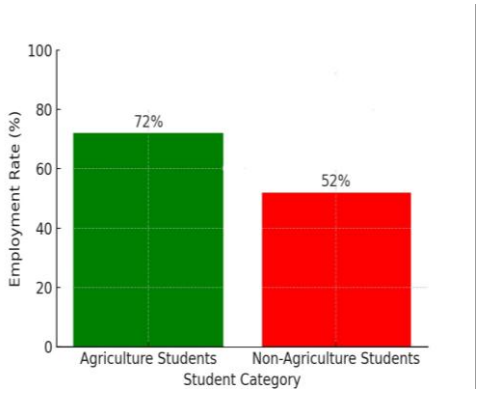

Fig. 1. Employment rate among agricultural and non-agricultural graduates.

Comparative study: Global best practices

Case study 1: India-National agricultural education policy

India's National agricultural education policy introduced agriculture as a core subject in rural schools, leading to a 15% increase in agricultural enrollments at universities and higher youth participation in farming. Government incentives, such as scholarships and agrotechnology incubation centers, further enhanced student engagement.

Case study 2: Philippines – Agri-focused senior high schools

The Philippines launched Agri-focused senior high schools (AFSHS) to train students in modern farming, agribusiness, and food technology. Graduates have a 58% employment rate, with many starting small agribusinesses after school.

Case study 3: Kenya – Vocational farming training

Kenya has vocational agricultural training centers integrated into the national education system. A significant 65% of students graduating from these programs find employment in agribusiness, agro-processing, and sustainable farming.

Challenges and recommendations

a. **Challenges in Bangladesh's agricultural education**

- Low policy implementation – Despite curriculum recommendations, agricultural education remains underfunded.
- Lack of awareness – About 62% of students perceive agriculture as a "low-income profession," discouraging enrollment.
- Insufficient industry collaboration – Less than 5% of agricultural students receive internships or apprenticeships in agribusiness firms.

b. **Policy recommendations for Bangladesh**

- Make agricultural education mandatory at the secondary level
- Following the India-Philippines model, agriculture should be integrated into school curricula.
- Increase practical training opportunities
- Establish school-based farms, agrotechnology labs, and hands-on vocational programs.
- Government and private sector collaboration
- Provide incentives for agrotechnology startups and scholarships for agricultural studies.
- Introduce public-private partnerships (PPP) to modernize agricultural education infrastructure.

The findings highlight a significant gap in Bangladesh's agricultural education system compared to global best practices. While agriculture remains a key economic sector, its declining share in GDP reflects the lack of a skilled workforce and low education integration. Countries like India, the Philippines, and Kenya demonstrate that mandatory agricultural education, vocational training, and industry collaboration lead to higher employment rates, agribusiness growth, and economic sustainability.

This study provides new insights into the relationship between agricultural education and employment, reinforcing the need for curriculum reforms, practical training initiatives, and government-industry partnerships. Future research should focus on longitudinal studies to measure the long-term economic impact of agricultural education reforms in Bangladesh.

Conclusion

The findings of this study highlight a significant gap in the current educational curriculum regarding agricultural releva-students and educators-strongly preferred integrating agriculture-focused subjects, especially in rural settings where farming remains central to livelihoods. Participants believe early exposure to agricultural education and hands-on practical experience can empower students with real-world skills, reduce rural-urban migration, and support local economic growth.

Additionally, an agriculture-based curriculum has the potential to address key challenges such as youth unemployment, food insecurity, and environmental degradation. Such a curriculum could promote long-term ecological balance and economic resilience by fostering awareness and competence in sustainable agricultural practices. Therefore, incorporating agriculture into mainstream education is not merely an academic enhancement but a strategic move toward sustainable national development and Sustainable Development Goals (SDGs), particularly:

- SDG 2 (Zero Hunger): Equipping youth with modern farming skills to improve food security.
- SDG 4 (Quality Education): Integrating hands-on learning and vocational training within curricula.
- SDG 8 (Decent Work and Economic Growth): Generating employment opportunities in agribusiness and reducing rural poverty.

However, challenges such as inadequate policy implementation, lack of practical training facilities, and minimal industry collaboration hinder progress. A structured, skill-oriented agricultural curriculum can significantly contribute to national food security, economic resilience, and sustainable development.

Based on the findings and successful global practices, several policy recommendations are proposed to strengthen agricultural education in Bangladesh.

First, agricultural education should be made mandatory at the secondary level by integrating it into all schools, following models from India and the Philippines. Modernizing textbooks complement this initiative by including emerging topics such as digital farming, climate-smart agriculture, and agribusiness fundamentals.

Second, enhancing practical training and infrastructure is crucial for effective learning. Schools should establish on-site farms, greenhouses, and agricultural laboratories to provide hands-on experience. Specialized agricultural high schools and vocational centers, similar to those in Kenya and the Philippines, should be developed to offer focused training. Additionally, internship programs and apprenticeships with agribusiness firms, research institutions, and commercial farms should be introduced to give students real-world exposure.

Third, stronger collaboration between the government and industry is necessary. Public-private partnerships (PPPs) should be encouraged to upgrade agricultural education infrastructure. Agribusiness companies can play a pivotal role by sponsoring students and funding agricultural research projects. Furthermore, implementing tax incentives and subsidies for institutions offering agricultural training can promote investment in the sector.

Fourth, promoting agricultural entrepreneurship and agrotechnology innovation can drive economic growth. Universities should establish agribusiness entrepreneurship incubation centers to support agri-processing, supply chain management, and digital farming startups. The curriculum should integrate AI, IoT, and data-driven agriculture to align with global technological advancements. Additionally, financial support, including low-interest loans and grants, should be provided to young agribusiness entrepreneurs to encourage innovation.

Finally, raising awareness and changing perceptions about agriculture is essential. Many students view agriculture as a low-income profession, discouraging enrollment in agricultural education. To address this, media campaigns, social platforms, and rural outreach programs should be leveraged to showcase successful agribusiness entrepreneurs and the potential for prosperity in the sector.

By implementing these recommendations, Bangladesh can enhance its agricultural education system, develop a skilled workforce, and ensure sustainable economic growth through innovation and modernized agricultural practices.

By executing these recommendations, Bangladesh can bridge the gap between education and agriculture and drive sustainable agricultural development in alignment with global best practices and SDGs.

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Conflict of Interest

The author declares that there is no conflict of interest regarding the publication of this paper. No financial, institutional, or personal relationships have influenced the research outcomes or the interpretation of the data presented in this study.

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