Government of the People's Republic of Bangladesh
Ministry of Agriculture

Program on Agricultural and Rural Transformation for Nutrition Entrepreneurship, and Resilience in Bangladesh (PARTNER)

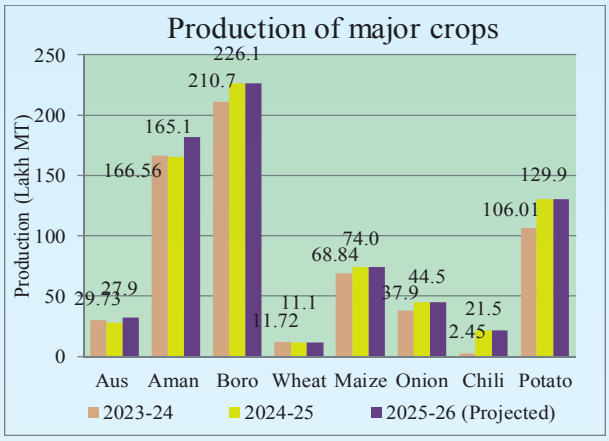
Analysis of linkages among Agricultural Stakeholders for Strengthening Synergies across Academia, Research, Extension, Farmers and Market Institutions

Key Messages

- Despite a decline in food production particularly rice-in 2023/24, projections for 2025/26 indicate an overall increase in both the cultivated area and output of major agricultural products in Bangladesh.
- Similarly, global cereal production and stocks are expected to rise by 2.3% in 2025/26, driven mainly by higher maize and rice output, with utilization expanding steadily across food, feed, and industrial sectors.
- The global cereal price index fell to its lowest level in July 2025. International rice prices declined due to weaker demand, while wheat prices registered a modest increase in June amid weather-related concerns in the EU, Russia, and the USA.
- In Bangladesh, non-food inflation remained stable, while food inflation declined. However, rice prices continue to be a key driver of both food and overall inflation. Given climate-related uncertainties during the Aman season, the Government may need to plan early rice imports to stabilize prices.
- In terms of technology generation and dissemination, linkages among stakeholders—academia, research institutions, extension services, farmers, and the private sector—remain low to moderate.
- Existing collaborations occur mainly through projects, workshops, seminars, training programs, dissemination activities, and germplasm exchanges. However, these efforts are constrained by policy and regulatory gaps, limited human and financial resources, weak incentives, inadequate technology validation, and insufficient monitoring and evaluation mechanisms.
- To strengthen these linkages and promote sustainable agricultural development in Bangladesh, a set of short-, medium-, and long-term policy measures is recommended.

Bangladesh agriculture update and outlook

Agriculture sector in Bangladesh contributes approximately 11.38% to total Gross Domestic Product (GDP), with the crop sub-sector alone accounting for about 5.54% (BBS, 2025). Department of Agricultural Extension (DAE) has projected a modest growth in the cultivated area of major crops by 2025-26. Aus, Aman and boro rice cultivated area fell by 8.67%, 0.73% and 0.22% respectively in 2024/25 from the previous year while maize, onion, and chili cultivation increased. During last winter season, there was a bumper harvest of potatoes, which considerably eased the pressure on the market and helped bring down the previously skyrocketing prices observed in December 2024. Looking ahead, the overall agricultural outlook appears promising, with the production of major crops expected to rise steadily. Notably, Aman rice production is projected to grow by 10.1%, and Aus rice is forecasted to increase by 15.4%, respectively although their production in the 2024/25 fiscal year has seen a decline compared to the previous year. This drop was mainly attributed to frequent and severe floods. On the other hand, boro production increased by 7.3% reaching 226.1 million tonnes in 2024/25. As a consequence, government decided to procure boro rice by 1.4 million MT in April, 2025 (Figure 1). These trends in area and production of major crops reflect growing demand and supply adjustments, shifting market dynamics, and strategic crop prioritization.



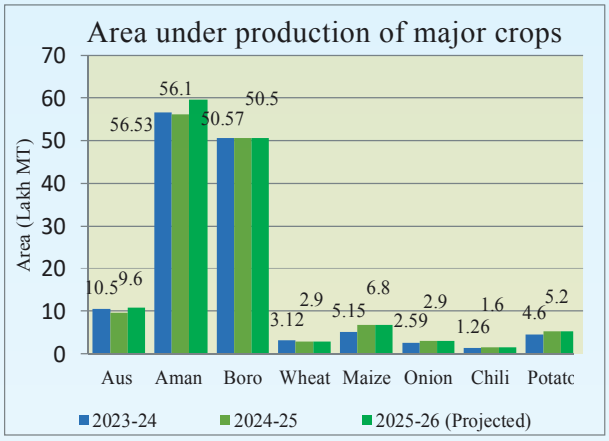


Figure 1: Area and production outlook of major crops in Bangladesh
Source: BBS, DAE, 2025

Global production and market price outlook for major crops

Global cereal production and utilization have been projected to reach a peak by FAO with a 2.3% increase in production over the previous year, driven mainly by higher maize and rice output. Utilization remains strong across food, feed and industrial uses. Global cereal stocks-to-use ratio would rise from 29.8 percent in 2024/25 to 30.3 percent in 2025/26 indicating sufficient supply prospects in the upcoming season. The increase is linked to a projected 0.9% rise in wheat stocks from the previous year (Figure 2).

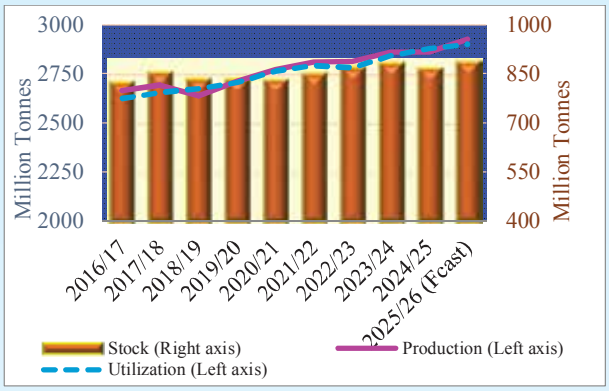


Figure 2: Cereal production, utilization and stocks
Source: FAO-AMIS Market Monitor-No. 130

World cereal price index as estimated by FAO consecutively fell by 0.8% to 106.5 points in July 2025, reaching the lowest level since September 2020. Global export prices of maize and barley rose, while those of sorghum and wheat declined. Wheat prices edged up slightly in June, despite seasonal harvest pressure due to weather-related concerns in parts of the European Union (EU), the Russian Federation and the USA. International rice prices dipped slightly, primarily for Indica varieties, reflecting softer demand.

General and food inflation and Contribution of major food item to food inflation in Bangladesh

In July 2025, inflation rose to 8.55%, up from 8.48% in June, after steadily declining from a peak of 11.38% in November. Food inflation in Bangladesh peaked at 13.80% in November but has declined since February 2025, falling below both general and non-food inflation rates. On the major category of food, rice contribution to food inflation was highest 51.55 percent in July (Figure 3). At the disaggregated level, both medium and coarse rice has the highest contribution to food inflation while vegetable contributed 8.58 percent in lowering the inflation rate. Other food items like hilsa, brinjal, tomato, pangash and soybean oil contributed high to moderate level to food inflation, whereas onion and potato has recorded 7.93 percent and 15.71 percent decline in food inflation.

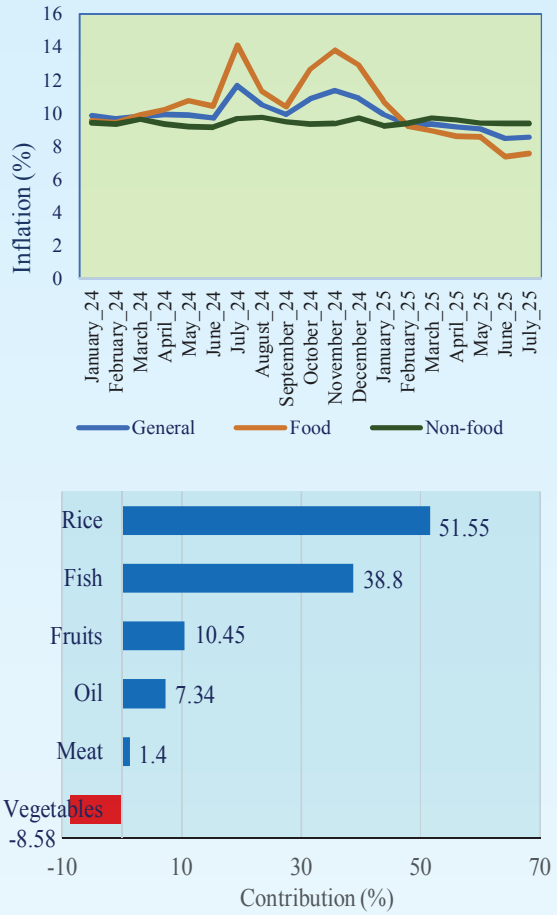


Figure 3. General, food, non-food inflation and contribution of major food item to food inflation, 2025.
Source: Bangladesh Bank & BBS, 2025

National and international policy outlook related to major agricultural commodities and their implications for Bangladesh

Table 1: International policy outlook and their implications for Bangladesh in 2025/2026

Crops	Worldwide policy shifts with focus on India	Implications for Bangladesh
Rice	India imposed 20 percent export duty on parboiled rice, semi-milled, wholly milled, and polished rice on May 1, 2025. In response, Bangladesh removed its 20% import duty and allowed duty-free import of 500,000 tonnes of rice.	While Bangladesh policy shift will help Bangladesh government to tackle domestic price rise through import but Indian export duty as well as uncertainty in Bangladesh Aman season climate, government should look for diversified import market.
Onion	India removed 20% duty on onion exports starting from 1st April that had been in effect since September 13, 2024.	This shift may help ease onion price volatility. Bangladesh may remove import duty and look for multiple cheaper sources.
Potato	In India, last season production was very good and they are exporting. Due to US reciprocal tariff, EU export to US will reduce and EU may look for exporting cheap potato in Asia.	By March 15, Bangladesh had nearly doubled last year's potato exports, but competitiveness remains key as the EU shifts to Asian markets amid US tariff tensions.
Maize	India has shifted from a net exporter to a net importer of maize due to rising domestic demand for livestock feed, starch, and ethanol. Brazil's maize exports are also expected to fall by 9% in 2025, driven by similar internal demand.	Although maize production is increasing, reduced exports from major suppliers may threaten the feed industry. It's crucial to boost domestic production and explore alternative sources, including the US.
Wheat	On July 9, 2025, Russia removed its wheat export tax. Bangladesh imported cheap wheat from Brazil in February 2025 and signed a five-year deal to import 700,000 MT annually from the USA.	Tariff removal is likely to ease price volatility as 60% of Bangladesh's wheat imports (7 million MT annually since 2024) come from the Black Sea region, mainly Russia.

Linkages, gaps and how to strengthen linkages among academia, research, extension, farmers and market institutions in Bangladesh?

Bangladesh agriculture has exhibited extraordinary progress and proved wrong all global projections of famine and starvation. However, recently agricultural development particularly crop sector growth slowed down or stagnant. Innovation is the key for sustainable agricultural growth. Low adoption of technology has often been attributed to

failure in the process of effective information transfer (Abiodun et al., 2000; Omotayo, 2005;Van den Ban & Hawkins, 1996). The linkage among the stakeholders (academia, research, extension, farmers, and private sector) encompasses a broad range of collaborations and exchange of useful information, technology generation, dissemination and utilization system (Davis et al., 2010). Integration among these stakeholder can improve the overall performance of agricultural technology (Joshi and Babu, 2021). Limited interaction between the actors prevents learning and the emergence of more beneficial outcomes (Rooyen et al., 2017). Agricultural innovation, productivity, sustainability and resilience depend on how well stakeholders work together (Jaishi et al., 2022). Strengthening the synergy among the stakeholders stands as a pivotal strategy to unlock the potential for agricultural innovation and achieve sustainability within smallholder farming (Nnadozie et al. 2015; Belay and Dawit 2017; FAO, 2020).

Despite remarkable progress in the country's agricultural sector, gaps remain in knowledge transfer and feedback loops among stakeholders. Addressing the current linkages and bridging the identified gaps are key to transforming agriculture into a resilient and inclusive sector. Therefore, this policy note focused on analyze the existing linkages among the stakeholders; identify strengths and gaps and recommend policy strategies to strengthen synergies for sustainable agricultural development in the Bangladesh using information collected from all the relevant stakeholder through stakeholder consultation as well as face to face semi-structured questionnaire interviews. Findings will enhance demand oriented technology generation, adoption and dissemination, enable evidence-based policymaking and build a more adaptive and market-oriented agriculture sector.

Current status of the linkages among academia, research, extension, farmers and market institutions in Bangladesh

The existing strength among the stakeholders are categories as “strong”, “moderate” and “low/week. Figure 4 shows that all the stakeholders are quite interlinked each other, however, many important relationships are still weak or underdeveloped and very few have strong connections. Farmers and frontline extension agents engage closely, and both have good relationships with the commercial sector and NGOs. There is moderate level of cooperation between universities and research institutions, but unanswered questions and gaps in follow-up indicate that there may be coordination problems. The reasonable linkage between CGIAR-academia and academia-private sector indicate opportunities for greater collaboration in curriculum development and knowledge sharing. Critical disconnects are indicated by these weak linkages, especially those between academia and extension and farmers, as well as the connections between CGIAR and ground-level players and private sectors. Furthermore, frequency of contact among the actors also confirm that most of the existing linkages are moderate to week except extension agents and farmers.

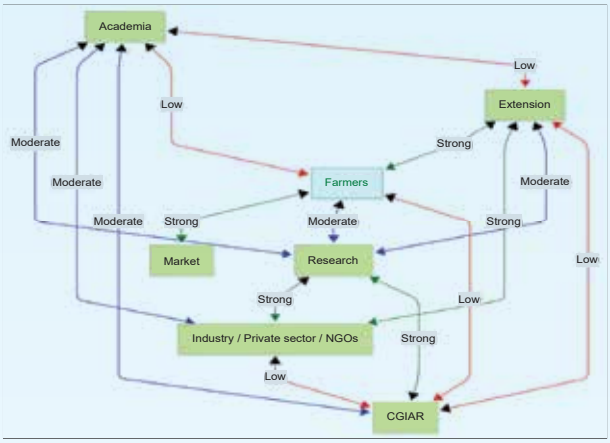


Figure 4. Strength of the linkage among the stakeholders.
Source: Survey and stakeholder consultation, 2025.

Nature and gaps of the linkages among academia, research, extension, farmers and market institutions in Bangladesh

How the stakeholders are interlinked with each other and what are the means and ways of interaction as well as gaps and constraints that hinder the linkages among different actors are presented in Table 2.

Table 2. Nature and gaps in the existing linkage among the stakeholders

Stakeholders	Nature of the existing linkages	Gaps/constraints in the existing linkages
Academia ↔ Research	- Collaborative research project - Student/Researcher exchange - Review workshop, Seminar and symposium - Higher education - Curriculum development	- Inadequate funding and project support; - Inadequate policy framework (including conflicting cross-institutional regulations and preferential arrangements); - Weak inter-institutional collaboration and technology transfer; - Research misalignment with actual needs; - Shortage of skilled manpower for execution and implementation.
Research ↔ Extension	-Review workshop, seminar & Field day; -Results and method demonstration, Field trial / evaluation; -Collaborative extension work -Input supply through extension;	-Insufficient funding, project and less interaction among stakeholders; -Ineffective communication and knowledge -sharing mechanisms; -Weak collaboration and technology validation processes.
Extension ↔ Farmer	New technology demonstration & group discussions; Farmer capacity building; Field Day, Farmers' Field schools & Training; Mobile Apps for farmers;	-Underutilization of available technologies; -Inadequate incentive structures for extension agents (low honorarium and rewards); -Insufficient funding and logistical support (vehicles, resources); -Limited capacity of extension personnel (knowledge and skills gaps); -Farmers' low awareness and negative perceptions; -Dealer-centric information flows; -Policy and regulatory gaps; -Geographic constraints (distance to services); -Poor monitoring and evaluation systems;
Farmers ↔ Market	Farmer mostly link with local market for input and output buying and selling; Farmer link to export market through contact farming and safe food production.	-Poor price realization due to excessive intermediaries; -Weak market linkages and monitoring; -Inadequate cold-storage and transport infrastructure in the grass root-level; -Limited access to and understanding of quality inputs; -Low adoption of modern agricultural technologies; -Absence of farmer cooperatives/group results less bargaining power;
Academia ↔ Farmers	Academic research disseminates to farmer; Demonstration/ Field trial/ Field Days; Trainings / Small group discussion & capacity building; Outreach program	-Inadequate funding and skilled manpower; -Poor communication and weak stakeholder linkages; -Weak institutional capacity limiting farmer outreach; -Low farmer motivation due to insufficient incentives and awareness; -Insufficient knowledge of and access to new technologies; -Time constraints for both farmers and academic extension services;
Academia ↔ Extension	Collaborative research; Helping in field survey/data collection	-Weak and distorted communication among stakeholders; -Administrative hurdles and limited field visits; -Few formal partnerships (MoUs) and inadequate funding; -Insufficient technical training and lack of bottom-up planning; -Absence of hybrid synthesis workshops.
Academia ↔ Private	Student internships; Workshop, Seminar; Project funding from corporate social responsibility fund; Consultancy advice	-Poor communication and interaction; -Complex administrative and bureaucratic hurdles; -Insufficient funding and budget allocations; -Limited skilled manpower and institutional capacity; -Weak or unclear policy guidelines; -Scarce collaborative initiatives among actors;
Research ↔ Farmers	Demonstration/ Field trial/ Field Days & Training; Technology transfer and input supply; Farmers sometimes directly contact with nearby researcher / scientist	-Poor communication and weak linkages between these stakeholders; -Inadequate funding and resource constraints; -Shortage of skilled personnel and research facilities; -Limited farmer education and technical training;
Research ↔ Market	Surveying the market for technology generation; Surveying consumers for preferences; Technology exchange & Germplasm sharing.	-Insufficient funding and resources; -No modern policy framework or steering committee; -Lack of market-driven research, monitoring, and evaluation; -Limited access to appropriate technologies; -Poor knowledge exchange and collaborative platforms;

Stakeholders	Nature of the existing linkages	Gaps/constraints in the existing linkages
Research ↔ Industry / Private sector / NGOs	Innovation exchange; Review workshop, Showcasing innovations; Product variety development; Training and seminar; Input exchange like fertilizer, micronutrients, pesticides through MoU; Germplasm sharing.	-Poor private sector and research linkages and onerous MoU procedures; -Private sector demands targeted expert collaboration; -Technology R&D isn't driven by real market needs; -Breeder seed and technical know-how exchange remains limited though demand at private sector is very high;
CGIAR ↔NARS/research	Germplasm exchange, Project collaboration; New technology transfer, Trial production; Capacity building through MoU; collaborative project	-Lack of need-based research, NARS does field trials CGIAR's work involve mostly surveys, no modeling, -Limited technology transfer, -Conservativeness of the government to involve with CGIAR, -Lengthy process of MOU
CGIAR ↔ Academia	Higher education; Collaborative research & Capacity building.	-Cumbersome MoU process; -Misaligned research interests; -Lack of regular, continuous activities; -Overreliance on short-term, project-based engagements.
CGIAR ↔ Extension & Farmers	On farm research & variety evaluation; field survey.	-Limited communication and study efforts; -Absence of formal MoUs; -Minimal direct engagement beyond surveys; -Unsustainable and mostly project-based activities; -Weak farmer outreach through CGIAR channels;
CGIAR ↔ Private	No significant linkages found except very few collaborative project.	-Weak communication and coordination -Administrative barriers to collaborate -Limited private sector capacity development -Misalignment between research agenda and private sector interests
Extension ↔ Industry / Private sector / NGOs	No significant linkages found except seminar, field meeting and training.	-Proven private technologies not effectively leveraged; -Routine communication without strategic updates; -No scheduled upgrades of input materials and mechanization; -Insufficient information sharing.

Source: Survey and stakeholder consultation, 2025.

Challenges faced by the stakeholders for strengthening the linkages

Academics and research stakeholders prioritize funding scarcity (89%), data access limitations (67%), and intellectual property issues (56%), are the major challenges for strengthening linkages. Actors in private sector emphasize bureaucratic difficulties (50%), intellectual property rights (63%), and a lack of understanding of the connections between research and industry (63%), highlighted as legal and procedural barriers for effective linkages. Meanwhile, extension agents point out communication gaps (71%), inadequate financing (57%), and a lack of capacity building programs (57%), which reflects capacity and outreach deficiencies (Figure 5). These differences highlight the critical need for well-coordinated funding models, efficient intellectual property right frameworks, and better cross-sector communication to bridge the gap and strengthening effect linkages among the stakeholders.

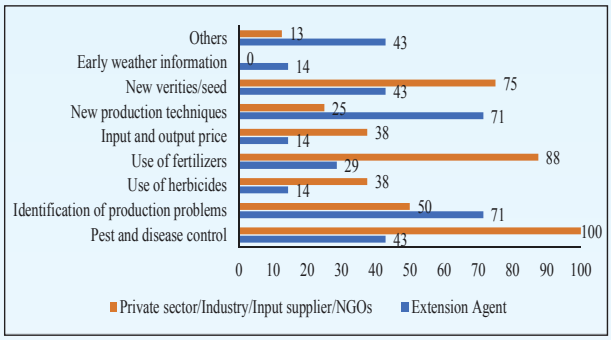


Figure 5. Challenges faced by the stakeholders (%). Source: Survey and stakeholder consultation, 2025.

Technical assistance desired by farmers from different actors

Farmers' desired technical assistance widely varied between diagnostic and input-focused needs. Although farmers' desire to extension agents for production related issues (71%) and the introduction of innovative production methods (71%), and pest and disease control (43%), few of them seek advice for fertilizers (29%) and herbicides (14%). On the other hand, from private sector farmers mostly demand recommendations on pest and disease management (100%), fertilizer (88%), new seeds (75%), and even price information (38%) (Figure 6). Given that crucial agronomic assistance is dependent on input providers, this reliance raises concerns regarding possible conflicts of interest and product-driven recommendations. Bridging this gap would need

strengthening extension knowledge and resources so that farmers receive impartial, comprehensive assistance instead of marketing-driven solutions.

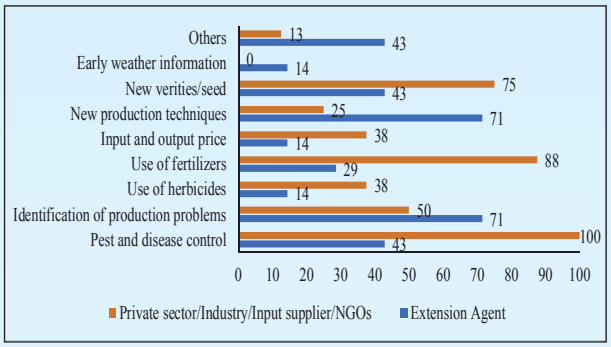


Figure 6. Technical assistances desired by the farmers (%) from different actors.
Source: Survey and stakeholder consultation, 2025.

Capacity building support required for the extension agents to address farmers need

The majority of the extension agents (86%) identify a need for greater ICT proficiency, indicating a drive toward digital and climate-informed outreach. Weather prediction skills (57%) and improved communication methods (57%) are also prioritized by extension agents. Persistent gaps in both technical know-how and the pedagogical methods of demonstration required to disseminate ground-level innovations are highlighted by the moderate demand for pest control, program planning, field demonstration, and monitoring and evaluation skills (Figure 7).

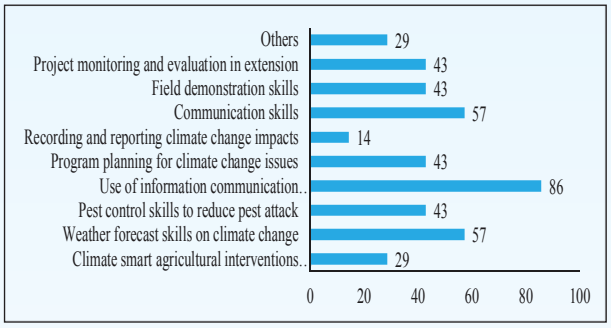


Figure 7. Capacity building support required by extension agents to address farmers' need (%).
Source: Survey and stakeholder consultation, 2025.

Dependency on technology and predictive skills implies the danger of neglecting fundamental abilities in farmer interaction and adaptive learning. To guarantee that extension services should provide timely and effective information, capacity-building program combined with ICT and climate modules as well as strong monitoring and evaluation, demonstration activities, and hands on skill development are necessary.

Stakeholders perceived reasons for farmer's non-adoption of recommended technologies

Various stakeholders have diverse point of views on farmers resistance no to use recommended technologies. Research & academic, private sector & extension agent have acknowledged tradition and resistance to change as a key barrier. According to extension agent and academia, farmers are not convinced for the benefit of the new technologies. Lack of the suitable production conditions is also important reason for not adopting new technologies. Private sector's emphasis on economic return (25%) and farmers' experience (13%) (Figure 8). Therefore, an integrated adoption plan must reconcile incentive frameworks, increase access to resources, and implement participatory demonstration models that demonstrate benefits while also recognizing farmers' skills, thus bridging the gap between perceived and real adoption factors.

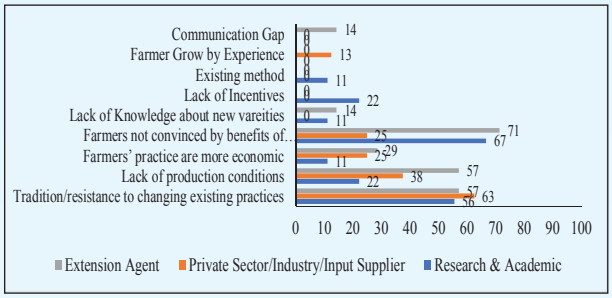


Figure 8. Perceived reasons for farmer's non-adoption of recommended technologies.
Source: Survey and stakeholder consultation, 2025.

Challenges of government extension system in Bangladesh

The dysfunction of extension system is exemplified by the significant discrepancy between private sector providers and government extension officials (Table 3). Insufficient workers, inadequate capacity building, knowledge sharing and communication gaps are the challenges that threaten to transfer cutting edge technologies. In contrast, extension agents mentioned different challenges such as political interference, inappropriate institutional policies, persistent underfunding, and a lack of trustworthy field trials or actual agricultural data as obstacle in the extension services. To overcome these obstacles, government must develop true public-private alliances, decentralize extension planning to meet farmer demands, invest in strong data systems, and establish performance-based incentives that align the motivations of extension officials and private service providers.

Table 3: Challenges reported by private sector/Industry/Input Supplier & Extension Agent

Private Sector/Industry/Input Supplier	Extension Agent
Limited extension workers & capacity building of public extension workers.	Limited manpower and inputs
Lack of communication and knowledge sharing	Political influences
Lack of technology transfer or less information on latest technology	Institutional inappropriate policies
Lack of Global extension knowledge, technology knowledge. Short project cycles	Right man not in right place
Promoting public technology, mostly sectors technology knowledge should be strengthen	Inadequate fund for training & research for extension work
Limited coordination with market channel and farmer. Centralized decision making process.	Limited of field trial
Lack of farmers demand driven planning or fail to understand farmers' needs.	Insufficient of real data on agricultural statistics
Quality control enforcement gaps	Lack of effort to convince farmer about latest technology

Source: Survey and stakeholder consultation, 2025.

What can we learn from the experience of Netherlands and India?

In the late 1990s, the Netherlands reorganized its agricultural knowledge system by merging Wageningen Agricultural University (WAU) with state research institutes (DLO), creating the comprehensive Wageningen University & Research (WUR). This strategic move enhanced synergy, critical mass, and collaboration between education and research functions. Students, researchers, and industry stakeholders collaborate on sustainable farming practices, hands-on training, and applied research. WUR integrates a university, applied research institutes, and extension services under one umbrella. WUR curricula practical oriented and act as living labs where students engage with farmers, industries, and communities directly—turning classrooms into laboratories for real-life problem solving. Furthermore, private sector, farmers' organizations, cooperatives, and agribusinesses are heavily involved in co-financing and co-designing research and education (Mulder and Kupper, 2006; Spiertz and Kropff, 2011; Mulder and Biemans, 2018; Vishnu, 2022). As like WUR, Indian Council of Agricultural Research (ICAR) is the apex body for coordinating, guiding, and managing agricultural research, education, and extension. Under ICAR, there are Over 100 ICAR research institutes and over 75 agricultural universities which conduct strong research and trained manpower, over 600 Krishi Vigyan Kendras (KVKs) act as frontline extension centers that also conduct on-farm adaptive research, multilocational trials and demonstrations (Babu et al., 2015; Pathak *et al.*, 2025).

From experience of both Dutch WUR and Indian ICAR Bangladesh could reduce fragmentation by bringing universities, research bodies, and extension agencies into joint platforms or networks or coordinated systems under Bangladesh Agricultural Research Council (BARC), encouraging collaboration instead of silos, make education more applied and field oriented. Should design policies that break silos, incentivize collaboration, invest in capacity, promote open knowledge, and ensure farmer-driven innovation. In short term as a pilot, ministry of agriculture through BARC can commission a joint Education–Research–Extension (ERE) projects in 1–2 priority value chains (e.g. rice) and learn about ways for merging or networking academic, research and extension services under a national Agricultural Knowledge & Innovation System (AKIS) in near future.

Conclusions and policy recommendations for strengthening the linkages

Macroeconomic challenges in the country have been addressed in a balanced manner and Bangladesh Bank aimed at lowering inflation rate below 7 percent by December, 2025. Non-food inflation remained stable throughout the last fiscal year. Potato and onion accounted for 15.7% and 7.93 % fall in food inflation in the first half of this year. Production of major crops is projected to rise

steadily despite Aus and Aman rice production dropped in 2024/25 than previous year mainly due to frequent floods while boro production increased by 7.3%. However, rice price remain a major challenge which need government attention. Stakeholders have weak to moderate linkages among themselves through collaborated projects, research, student and research exchange, review workshop, seminar, demonstration, MoU, knowledge sharing, etc. Limited cross cutting policies, resource including funding and skill manpower constraints, technology validation, weak monitoring and evaluation, policy and regulatory gaps are restraining the extent of linkages among the stakeholders. Therefore, for strengthening the linkages among the stakeholder following short, medium and long term policies are suggested as outlined by the different stakeholders.

Short-term policy recommendations:

- ✓ Research agenda and priority should be identified and set by consulting with all stakeholders including academia, research, extension, farmers, private sector and NGOs as well as relevant CGIAR organizations.
- ✓ Each stakeholders should organize annual review and planning workshop where representative from each academia, research, extension, farmers, private sector, NGOs and relevant CGIAR organizations participation should be ensured/compulsory.
- ✓ NARS annual research program with sufficient funding should ensure research and academia collaboration (complementary relationship) in multidisciplinary fashion and under the annual research program MS and PhD student involvement should be compulsory and joint supervision should be encouraged.
- ✓ All research, technology, innovation dissemination activities (e.g. seminar, symposium, workshop, field days, demonstration, farmer field school, technology fair, etc.) organize by any stakeholder should ensure participation of representative from academia, research, extension, farmers, private sector, NGOs and relevant CGIAR organizations.
- ✓ Develop continuous monitoring, evaluation and rewarding mechanism based on output and outcomes to encourage participatory, need based and location specific technology generation, dissemination and greater outreach for all stakeholder particularly for academia, research and extension and based on feedback required actions should be taken.
- ✓ Establish a common pool of expert from all stakeholders academia, research, extension, led farmers, private sector, NGOs and relevant CGIAR organizations and organize brain storming workshop/session and review the gaps and generate practical and actionable suggestions for strengthening linkages for sustainable agricultural development in the country.

Medium-term policy recommendations:

- ✓ Update need based and practical oriented academic curricula with sufficient knowledge on ICT based extension, updated state of the art research methods and design capacity building hands on living lab type training program for farmers, extension agents as well as researcher where and when needed by involving competent trainers from national and international experts.
- ✓ Establish a separate cell in MOA or at BARC for spearheading the 'Lab to Land programme' (LLP) by coordinating and interacting with all actors for empowering farmers about emerging technologies, farm innovations and information. Potential activities under LLP can be on farm testing, frontline demonstration, capacity development, act as knowledge and resource center, farm advisories (on some critical parameters such as weather, market prices, plant protection, cold storage, etc.), common service center, multi-stakeholder platform, model village, skilling/training youth in various agro-enterprises, portal, apps, ICT based quick hands on solutions, and use social media platforms to bridge the gaps.
- ✓ All the relevant organizations including academia, research and extension should revised and reorient development priorities, institutional responsibilities, vision, mission and all these should include a clear indication of linkages among other actors in all their technology generation and dissemination activities.

- ✓ Ministry of agriculture through BARC can commission a joint Education - Research-Extension (ERE) research projects in 1-2 priority value chains (e.g. rice) and learn about ways for merging or networking academic, research and extension services under a national Agricultural Knowledge & Innovation System (AKIS) in near future.
- ✓ Accelerate dissemination of the latest agricultural technologies through various channels such as SMS and digital platforms, awareness campaigns and app-based support, and co-design special programs with local farming communities. Enhance germplasm and know-how exchange program between different stakeholders, organize exchange visit among the stakeholders (e.g. farmer - academia, farmers - research, farmers-led farmers, etc.)

Long-term policy recommendations:

- ✓ Develop clear policies, regulations and operational guidelines for effective collaboration and linkages among the stakeholders including private sector and CGIAR centers to actively participate in planning, designing and dissemination activities.
- ✓ Develop dynamic and real-time digital public infrastructure (DPI) and digitally skilled manpower at all levels through training and capacity building for efficient information and technology dissemination.
- ✓ Recruit competent manpower, develop infrastructure including cold-chain and transportation infrastructure, and market infrastructure, establish and support cooperatives and farmer groups, ensure sufficient and continuous fund flow and other resources for sustainable agricultural development through effective linkages among the stakeholders.
- ✓ Develop an integrated development programs in the agricultural higher education (integrated system of teaching, research and extension) or at apex body of the NARS system by integration NARS and extension systems including private sector as like WUR or ICAR. That will be less expensive and more efficient (use of the existing infrastructure, professional manpower, and sound research) than programs conducted by other similar development organizations.

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