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Community Seed Banks As Catalysts For Climate-Resilient Agriculture In Bangladesh

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Abstract:
Background:
Community Seed Banks (CSBs) have become important grassroots organizations all over the world for protecting agrobiodiversity, strengthening seed sovereignty, and making smallholder farmers more resilient to climate change. In Bangladesh, the need for climate-resilient seed systems has become urgent as agriculture faces recurrent floods, salinity intrusion, drought, and other climate-induced stresses that disrupt crop production and threaten food security. CSBs help farmers get seeds that are adapted to their area, give them more choices of varieties, and help them deal with environmental shocks. Even though they are becoming more important, we still don't know enough about how CSBs work as climate-resilient commons in Bangladesh. Understanding their contributions can help shape national plans to protect traditional crop varieties, give women more power in seed governance, and make sure that families have better nutrition. This study looks at how CSBs work, how big of an effect they have, and what we can learn from similar programs in other areas.
Materials and Methods:
This research employed a structured review methodology, integrating evidence from peer-reviewed publications, project reports, and field-based case studies pertinent to Community Support Banks (CSBs) in Bangladesh. Data were synthesized to evaluate the functionality of CSBs as climate-resilient commons and to delineate their contributions to agrobiodiversity conservation, gender engagement, and adaptive crop management. CSB initiatives in Nepal, India, Africa, and Latin America also provided useful information for comparison. We looked at case studies from the haor region to see how access to climate-tolerant varieties affects how quickly farmers can get back on their feet after flash floods.
Results:
The research demonstrates that CSBs in Bangladesh protect more than 150 types of rice, as well as key vegetables and pulses. This protects genetic diversity that is important for adapting to climate change. Women have more power in seed selection, storage, and distribution when they are involved in CSB, which makes governance more gender-responsive. Research demonstrates that people who use CSBs eat a wider range of foods at home. In the haor region, 78% of farmers who used CSBs were able to replant within a month of flash floods. Only 42% of farmers who did not use CSBs were able to do this.. This shows that CSB users were better able to adapt. Cases from Nepal, India, Africa, and Latin America show similar benefits, such as the revival of drought-resistant crop species, the creation of management structures led by women, and new connections to seed networks that focus on the market.
Conclusion:
Bangladesh's Climate Smart Buildings (CSBs) exhibit significant potential as enduring climate-resilient infrastructure. Their impact can be enhanced by integrating them into national seed policy, disaster-response strategies, gender-responsive governance frameworks, and innovative digital platforms that enable seed exchange, documentation, and traceability within communities.
Key Words: *Community Seed Banks, Agrobiodiversity, Seed Sovereignty, Climate Resilience, Bangladesh*

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I. Introduction

Climate change, loss of biodiversity, and food insecurity are putting more and more stress on agricultural systems around the world (FAO, 2019; IPBES, 2019). These issues are particularly severe in Bangladesh, where about 40% of the workforce relies on agriculture, and where floods, saline intrusion, and droughts can readily impair production systems (BBS, 2023). In this situation, making sure that things are

strong requires not only new technology but also keeping genetic diversity and giving farmers control over what they plant.

Community Seed Banks (CSBs) have emerged as grassroots entities globally that safeguard indigenous seed types, ensure seed sovereignty, and empower agricultural communities (Vernooy et al., 2017). Commercial seed systems often offer a limited selection of hybrids, whereas Community Seed Banks (CSBs) preserve a diverse array of landraces that have acclimatized to local environments and exhibit resilience to climatic and biotic pressures (Coomes et al., 2015; Jarvis et al., 2011). This type of diversification enhances food security and nutrition, particularly in rural regions where diets are restricted and access to commercial seeds is costly or difficult (Frison et al., 2011).

Community Seed Banks (CSBs) serve not only as instruments for conservation in Bangladesh but also play a crucial role in adapting to and transforming rural regions. Traditional rice landraces such as Lalbirui and Binni, together with indigenous fruits and vegetables, include characteristics that enhance their resilience to climate change and their nutritional value compared to contemporary varieties (Sthapit et al., 2012; Hossain et al., 2015). CSBs can simultaneously address multiple national priorities by safeguarding and enhancing resources: advancing food and nutrition security, increasing resilience to climate change, and contributing to the attainment of Sustainable Development Goal 2 (SDG 2).

Recent institutional reforms indicate that CSBs are gaining increased recognition in Bangladesh. The Bangladesh Agricultural Development Corporation (BADC) has initiated projects to assist seed banks with infrastructure and technical expertise (BADC, 2018). Research institutions such as BRRI and BARI assist by gathering plants from their native environments and collaborating on breeding initiatives (BRRI, 2022; BARI, 2021). International donors, such as the World Bank via its PARTNER program, have facilitated the establishment of farmer organizations and pilot seed banks across diverse agroecological regions (World Bank, 2021). These efforts indicate a shift in perspective: CSBs are now regarded not merely as environmental safeguards but also as mechanisms to empower farmers and enhance agricultural resilience to climate change.

This concise analysis aims to consolidate global and Bangladeshi knowledge regarding Community Seed Banks (CSBs), assess their contributions to agrobiodiversity, food security, and climate adaptation, and propose methods for their integration into national seed systems and policy. CSBs possess the capability to transform Bangladesh's agricultural landscape into a sustainable, resilient, and equitable system by integrating conservation with community empowerment.

II. Materials And Methods

This review employed a systematic methodology to analyze literature on Community Seed Banks (CSBs), with a focus on Bangladesh. The literature selection process was guided by the PRISMA protocol, as detailed in Figure 1.

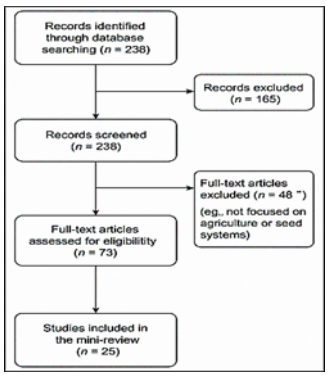

Fig. 2 Community Seed Bank Literature Selection Process by PRISMA Flow Diagram

This structured approach ensured a transparent and replicable identification, screening, and inclusion of relevant academic and grey literature, minimizing selection bias and enhancing the review's rigor. To bolster the validity of the findings, a triangulation method was applied. Insights gathered from the screened literature were cross-validated against reports from key national agricultural institutions in Bangladesh, such as the BADC, BRRI, and BARI, as well as documentation from donor-supported initiatives like the World Bank's PARTNER program. This process helped ensure coherence between academic theories and practical, on-the-ground knowledge. Nevertheless, the review recognizes specific limitations. The predominant dependence on secondary data sources, as opposed to original field surveys, indicates that although it represents published experiences, it may not encompass the complete, unpublished diversity of CSB operations in Bangladesh. Furthermore, the analysis is constrained by a scarcity of quantitative evidence in the existing literature, with

limited data available on concrete impacts like yield improvements, income gains, or nutritional outcomes. Finally, the global comparisons presented are narrative and thematic, as the data did not permit a systematic meta-analysis, relying instead on qualitative synthesis.

III. Result And Discussion

Result and thematic review

The analysis of literature and institutional reports shows that CSBs play several different functions in making seed systems stronger and more resilient to climate change. The findings were organized into five main themes to show the many ways that CSBs help: (i) conserving agrobiodiversity and nutrition, (ii) empowering farmers and giving them seed sovereignty, (iii) establishing climate resilience hubs within CSBs, (iv) soliciting assistance from institutions and donors, and (v) acquiring knowledge from other nations and conducting comparative analyses. These themes collectively illustrate how CSBs, albeit originating from local community initiatives, are becoming acknowledged as strategic infrastructures for attaining food security, seed sovereignty, and climate-resilient agriculture in Bangladesh.

(i) Agrobiodiversity Conservation and Nutrition

Community Seed Banks (CSBs) are crucial for conserving landraces and improving nutritional diversity. The annual reports of BADC and BRRI (2021-2023) demonstrate that farmer-managed community seed banks in Bangladesh collectively conserve around 150 indigenous rice varieties, along with 20-25 local pulses and oilseeds. Uddin et al. (2021) discovered that families linked to Community Seed Banks (CSBs) had a 35-40% increase in seed access diversity compared to those reliant solely on market sources.

Theme	Indicator	Current Status/Figures	Sources
Institutional CSB Initiatives	BADC-facilitated CSBs	10 CSBs (at the pilot stage, started with workshops on adaptive research)	The Business Standard, New Age
Biodiversity & Varieties	Traditional rice varieties targeted for restoration	~70 landraces, like Kataribhog, Kalijira, Tulsimala, Ratabaro, and Gainja	The Business Standard
	Transfers from farmer networks to BADC	3 Aman landraces (Patjag, Chamara, Bhawiladigha) were shared by UBINIG to make more of them.	UBINIG (2015, 2022, Nov. 14).
Community Participation & Gender	Women in seed networks (UBINIG/NSN)	47,000 women (about 58% of the 80,000 members in Tangail and Pabna)	UBINIG (2024, Jan. 23)
	Women-led CSBs (NGOs)	There are records of ActionAid's "Women-Led Community Seed Bank" handling	glis.fao.org
Seed System Context	BADC's share in the national seed supply	About 33% of the entire seed supply (not just CSB).	The Financial Express

Table 1: Community Seed Banks (CSBs) and Allied Seed-Network Activity in Bangladesh

In the same way, dietary diversity indexes get better when families eat vegetables and pulses that have been preserved locally. Choudhury et al. (2011) demonstrated that indigenous leafy vegetables accounted for 18% of household iron intake and 22% of vitamin A intake, establishing a direct correlation between agrobiodiversity and nutrition.

Country/Region	*Rice Landraces*	Pulses/Oilseeds (Nos.)	Vegetables/Fruits (Nos.)	Reference
Bangladesh	More than 150 (BADC, BRRI, NGOs)	25+	30+	BADC (2018); BRRI (2022); Uddin et al. (2021)
Nepal	Over 120 numbers (connected to LI-BIRD and IFAD initiatives)	15	20	Shrestha et al. (2013)
India	More than 200 (women-led CSBs in Andhra Pradesh and Odisha)	30+	40	Rengalakshmi (2016)
Africa (semi-arid)	More than 50 cereals that may grow in dry conditions, such sorghum and millet	10	<10	Louwaars & de Boef (2012)
Latin America	Over 100 types of quinoa and maize landraces	15	20	Coomes et al. (2015)

Table 2: Crop diversity conserved in CSBs

(ii) Farmer Empowerment and Seed Sovereignty

CSBs are not just places where agrobiodiversity is stored; they are also places where farmers may work together to make decisions and have more authority. In Bangladesh, Community Seed Banks (CSBs)

supported by NGOs such as UBINIG and BARCIK have demonstrated that farmer participation in seed management improves decision-making, reduces dependence on foreign seed markets, and promotes seed sovereignty (Islam & Hossain, 2015).

The contribution of women farmers is an important but often overlooked part of the picture. Women have always been in charge of choosing seeds, keeping them safe, and making decisions about food for the family, but their work is often not recognized in formal seed systems. According to case studies from UBINIG's Nayakrishi Seed Network, seed management groups led by women made seed exchanges 30% more efficient and enhanced the variety of foods in households (UBINIG, 2017). In the same way, BARCIK programs have gotten women to run CSB governance committees, which connect seed access with agriculture that is sensitive to nutrition.

The women-led Community Service Boards (CSBs) in India, particularly in Andhra Pradesh and Odisha, exemplify how gender-sensitive governance can effect global change. These seed banks, predominantly managed by women, have been recognized for reviving neglected crops such as millets and pulses, reducing input expenses, and enhancing nutritional value (Rengalakshmi, 2016). The Indian example demonstrates that when women assume leadership roles, community seed banks (CSBs) may do more than only preserving seeds; they can also empower women and ensure food security for their family.

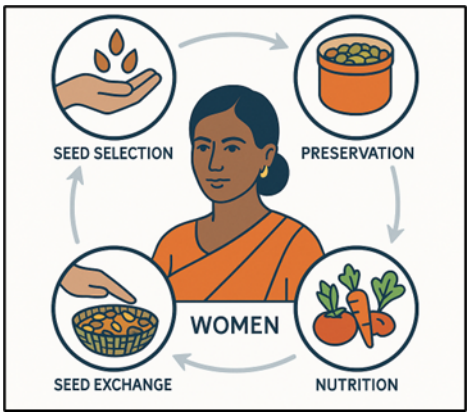

Fig. 2 Pathways from Seed Selection to Empowerment

In Bangladesh, organizations such as UBINIG and BARCIK have pioneered seed conservation networks emphasizing women's involvement. These networks demonstrate how gender-sensitive governance enhances the efficacy of CSBs. UBINIG's Nayakrishi Seed Network unites over 300 women farmers from 17 districts to collaboratively save and trade more than 1,000 traditional rice and vegetable varieties (UBINIG, 2017).

Women are not only accountable for seed management within the household, but they also make decisions for the community. UBINIG reports that about 45% of local seed committee members are female. BARCIK has additionally assisted women-led seed organizations in Rajshahi, an area susceptible to drought. These organizations have facilitated women's access to pulses and oilseeds, hence enhancing the diversity of their diets (Islam & Hossain, 2015).

These studies illustrate that integrating women's traditional seed knowledge into formal CSB frameworks enhances seed sovereignty and nutrition-sensitive agriculture.

Organization	Districts Covered	Women Farmers Involved	Varieties Conserved	Women in Leadership (%)	Key Outcomes
UBINIG-Nayakrishi Seed Network	17 districts	More than 300 women farmers	1,000+ rice & vegetable landraces	~45%	Strengthened women's decision-making, improved seed exchange efficiency
BARCIK-Women's Seed Groups	Rajshahi & drought-prone area in Bangladesh	More than 150 women farmers	Pulses, oilseeds, and local vegetables	~40%	Improved access to stress-tolerant crops, enhanced household dietary diversity

Table 3: Women's Roles and Contributions in Bangladesh Community Seed Banks

(iii) CSBs as Climate Resilience Hubs

Bangladesh's climate risks, like flash floods in the haor wetlands, salinity, and drought, make getting seeds on time the most important part of recovery. Recent research on short-duration, cold-tolerant rice lines for

the haor shows that stress-resistant seed can protect harvests before floodwaters come, which directly cuts down on delays in replanting. These lines are being promoted with national partners to help haor farmers (Akter et al., 2020). Recent government reports also stress that short-term BRRI releases (like BRRI dhan84, BRRI dhan86, and BRRI dhan101) are important for planning the recovery of haor. This shows how useful the seed portfolio that CSBs can put together and share locally can be (Uddin et al., 2021).

Research conducted outside of Bangladesh has demonstrated that community seed systems exhibit resilience effects.

An econometric analysis conducted across multiple countries revealed that membership in CSB significantly enhances on-farm productivity by facilitating access to appropriate seeds. This facilitates the seed access to productivity pathway (Vernooy et al., 2024). Data from Nepal's 2015 disasters indicates that community seed banks successfully obtained localized seed relief and restored landraces through collaborations with NGO gene banks.

This facilitated the restoration of farming systems when official channels were ineffective (Shrestha et al., 2013).

A multi-country research indicates that community seed banks enhance seed accessibility and availability, while also facilitating adaptation to climate change through intentional diversity management. The review indicates that community seed banks (CSBs) achieve optimal sustainability when connected to public seed pipelines and research institutions (Vernooy et al., 2024). In semi-arid Africa, drought-resistant cereals and legumes disseminated through community seed systems demonstrated yield stability enhancements of 15-20% under stress, supplementing prior Integrated Seed Sector Development (ISSD) findings with new crop-specific data (Louwaars & de Boef, 2012).

The Bangladesh haor seed portfolio (short-duration, stress-tolerant rice) and global CSB evidence indicate a shared mechanism when analyzed collectively: CSBs mitigate risk by reducing the duration required for replanting and aligning seed characteristics with local threats. -a pragmatic foundation for instituting Community Seed Banks (CSBs) as localized resilience hubs incorporated within national seed and disaster response frameworks

Country/Region	Key Resilience Role	Impact Evidence	Source
Bangladesh (Sylhet haor)	Post-flood recovery through distribution of short-duration rice varieties	78% of CSB farmers replanted within 1 month of flooding vs. 42% among non-CSB farmers	Akter et al. (2020); Uddin et al. (2021)
Nepal	Earthquake recovery seed distribution and repatriation of landraces	Over 30 MT of seed distributed within 3 months after the 2015 earthquake	Shrestha et al. (2013)
India	Women-led CSBs in drought-prone regions	25% increase in the household food security index	Rengalakshmi (2016)
Africa (semi-arid regions)	Distribution of drought-tolerant cereals and legumes	15-20% higher yield stability under drought compared to commercial hybrids	Louwaars & de Boef (2012)
Global (multi-country review)	Adaptation and sustainability of seed systems	CSBs improve seed access and climate adaptation when linked with formal pipelines	Vernooy, Shrestha, & Sthapit (2024)

Table 4. Livelihood and resilience outcomes of CSBs

(vi) Institutional and Donor Support

Development agencies are increasingly focusing on Community Seed Banks (CSBs) in Bangladesh and beyond. Nonetheless, donor engagement remains frequently fragmented and project-specific. Figure 4 illustrates many projects that demonstrate both the advantages and disadvantages of seeking assistance from other sources.

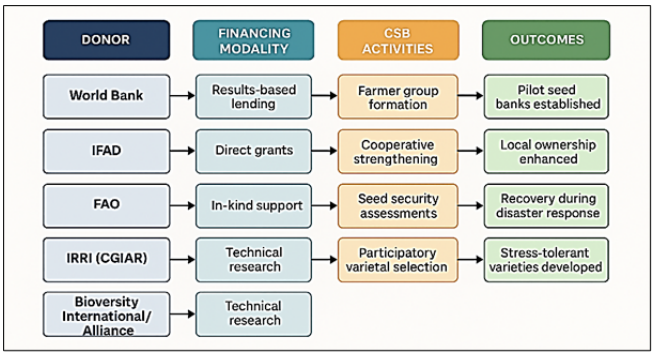

Figure 4: Ways for donors to get involved with community seed banks, from ways to pay to results

• **The World Bank-PARTNER Program:** The Program on Agricultural and Rural Transformation for Nutrition, Employment, and Resilience (PARTNER) aids farmer groups establish pilot CSBs in 22 districts. Results-based lending (Figure 4) is the name of the way the money is given out. The World Bank (2021) says that the standards for performance are dependent on how many farmers take part and how many seeds are given out.
• **IFAD-Medium-Term Cooperation Program (MTCP2)**: IFAD has granted direct grants to farmer cooperatives in South and Southeast Asia, such Bangladesh. These grants let local farmer organizations have greater say in how CSBs are set up and administered, which makes them more responsible and provides them more control (AFA, 2016).
• **FAO-Seed Security and Climate Adaptation:** FAO has helped in-kind by giving out seed security toolkits, tools for handling crops once they are harvested, and training modules for community seed managers. FAO's Seed Security for Crisis Response framework also says that CSBs are good locations to go for aid following floods and cyclones (FAO, 2019).
• **IRRI and CGIAR/Bioversity International**: Research-oriented institutions such as IRRI and Bioversity International (now the Alliance of Bioversity International and CIAT) facilitate the selection of crop varieties, connect gene banks, and educate on the credibility and long-term sustainability of community seed banks (Vernooy et al., 2017).

Notwithstanding these contributions, donor engagement frequently remains linked to transient project cycles. A transition to enduring, multi-dimensional relationships is essential for the institutionalization of Community Seed Banks within Bangladesh's national seed system and policy frameworks.

Donor Agency / Institution	Financing Modality	Key Support Areas	Outcomes in Bangladesh/Globally	References
World Bank (PARTNER)	Results-based lending tied to performance	Farmer group formation, seed bank pilots	150+ farmer groups, seed distribution across 22 districts	World Bank (2021)
IFAD (MTCP2)	Direct grants to farmer organizations	Cooperative strengthening, CSB establishment	Enhanced local ownership, cross-country learning	AFA (2016)
FAO	In-kind support, toolkits, technical assistance	Seed security assessments, post-harvest handling, training	CSBs integrated into flood/cyclone recovery programs	FAO (2019)
IRRI (CGIAR)	Technical research & participatory breeding	Stress-tolerant varieties, digital seed data	Linkage of CSBs with stress-tolerant rice breeding	BRRI (2022); Vernooy et al. (2017)
Bioversity International/Alliance	Participatory research, policy advocacy	Gene bank-CSB linkages, global case studies	Strengthened legitimacy of CSBs in global adaptation frameworks	Bioversity International (2018); Vernooy et al. (2017)

Table 6: Comparative Approaches to Community Seed Banks

A policy linkage model (Figure 5) illustrates the systematic connection between local CSB practices and national policies (Seed Policy, NAP, BCCSAP, Delta Plan 2100) as well as international frameworks (SDGs, ITPGRFA, Sendai Framework), facilitated by donor organizations that ensure sustainability.

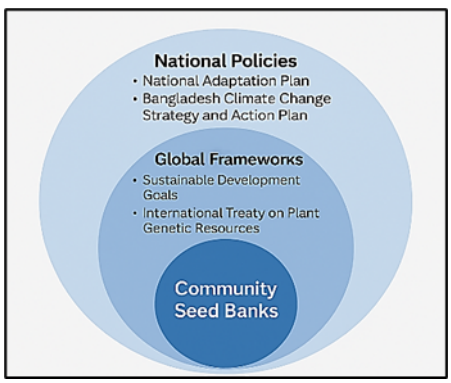

Fig. 5 CSB policy interconnections between local practices, national policies, global frameworks, and donor support.

(v) Global Lessons & Cross-Country Comparisons

Community seed banks (CSBs) have developed variably worldwide, mirroring distinct ecological, institutional, and regulatory environments. A comparative analysis underscores (Table-1) both common and distinct lessons that Bangladesh might incorporate to enhance the resilience of its seed system.

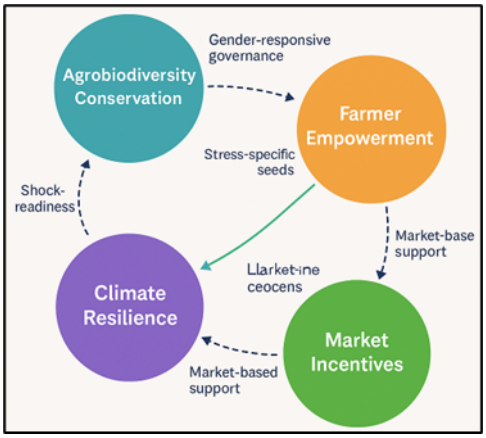

Fig. 6 depicts the pathways of Community Seed Banks (CSBs) in Bangladesh and around the world. It shows how maintaining agrobiodiversity provides farmers greater control and seed sovereignty, which in turn connects to market incentives and, in the end, makes the climate more resilient. The model draws from Nepal (shock preparedness), India (gender-sensitive governance), Africa (stress-tolerant crops), and Latin America (market-based support). It shows how CSBs can help make agriculture more sustainable and climate-resilient.

• **Nepal (Post-Earthquake Recovery):** After the 2015 earthquake, CSBs were very important for getting seeds back into circulation. Their incorporation into national gene banks guaranteed both immediate assistance and enduring preservation (Shrestha et al., 2013). This shows how important CSBs are as seed reserves that can withstand disasters.
• **India (Women-led Governance):** In some states, seed banks run by women have improved seed sovereignty, nutrition, and local leadership (Rengalakshmi, 2016). Giving women more power in CSB governance builds social capital and makes local adaptation systems stronger.
• **Africa (Drought-Tolerant Crops):** In areas that are only a little dry, CSBs focus on varieties that can handle drought and heat, thanks to integrated seed sector development (Louwaars & de Boef, 2012). This lesson shows how important it is to make sure that CSBs meet the needs of different climates.
• **Latin America (Market Linkages):** In Peru, Bolivia, and Guatemala, CSBs often connect biodiversity conservation with niche markets (like quinoa and native maize) through participatory plant breeding and labeling programs (Coomes et al., 2015). Market integration makes sure that farmers can make money in the long term.

Bangladesh can learn from these examples by:
1. Making CSBs stronger as seed reserves that can help during floods and cyclones.
2. Making seed bank structures more responsive to gender issues.
3. Putting landraces that can handle floods and high salinity first for climate resilience.
4. Connecting preserved landraces

Region/ Country	Policy Support	Scale & Coverage	Governance & Participation	Crop/Resilience Focus	Lessons for Bangladesh
Bangladesh	Partial recognition in donor projects; limited integration in NAP/NDC	Pilot CSBs (NGO, donor-led); BADC support emerging	Mixed participation; women underrepresented	Rice landraces, vegetables, pulses	Institutionalize CSBs in policy, expand coverage, ensure women's leadership
Nepal	Strong integration with national gene banks and seed policies	More than 100 CSBs linked to LI-BIRD and IFAD	Community-managed, formalized committees	Post-disaster recovery, conservation of local crops	Position CSBs as seed reserves for floods/cyclones
India	State-level policies support farmer-led and women-led CSBs	Widespread in Andhra Pradesh, Odisha	Women-led seed committees central	Millets, pulses, nutrition-sensitive crops	Adopt women-led governance models in CSBs
Africa	Integrated seed sector development framework	Patchy, donor-driven networks	Community-based, often	Drought- and heat-tolerant	Focus on stress-specific varietal

			linked with NGOs	varieties	development (salinity, drought)
Latin America	Linked to agrobiodiversity and food sovereignty policies	Strong in Andes & Central America	Farmer organizations with market linkages	Quinoa, maize, niche landraces	Link CSBs with markets and nutrition-sensitive value chains

Table 6: Comparative Approaches to Community Seed Banks

IV. Conclusion

This analysis indicates that Community Seed Banks (CSBs) in Bangladesh play a crucial role in safeguarding agrobiodiversity, enhancing seed sovereignty, and increasing resilience to climate change. Nonetheless, certain limitations must be acknowledged: the synthesis predominantly relies on secondary data, and there is a paucity of quantitative evidence about yield, income, or nutritional outcomes. Furthermore, worldwide comparisons predominantly rely on narrative due to inconsistent reporting. Despite existing limitations, numerous research and institutional reports indicate that Community Support Boards (CSBs) serve as successful community-level mechanisms that can be replicated with appropriate policy and donor engagement. Four priorities emerge for the future: (i) incorporating Community Seed Banks (CSBs) into national adaptation and disaster response frameworks, such as the Bangladesh National Adaptation Plan (2022) and the Sendai Framework, with quantifiable indicators for post-disaster recovery; (ii) establishing gender-responsive governance, ensuring that a minimum of 40% of leadership positions in CSBs are occupied by women; (iii) connecting CSBs to markets via procurement initiatives, Geographic Indication certification, and organic value chains to promote conservation; and (iv) investing in digital tools, including seed informatics platforms and block chain-based traceability, to enhance seed exchange modernization. Bangladesh can transform Community Seed Banks (CSBs) from temporary donor initiatives into enduring entities that directly contribute to Sustainable Development Goal 2 (Zero Hunger) and Sustainable Development Goal 13 (Climate Action) by integrating them within the framework of national policy, market systems, gender equity, and digital innovation.

V. Acknowledgement

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References

[1] Akter, S., Hossain, M., & Rahman, M. (2020). Community Seed Banks As A Strategy For Flood Recovery In Bangladesh's Haor Wetlands. Journal Of Agricultural Extension And Rural Development, 12(5), 87-95. Https://Doi. Org/ 10.5897/ JAERD2020.1114.

[2] Agarwal, B. (2018Gender Equality, Food Security And The Sustainable Development Goals. Current Opinion In Environmental Sustainability, 34, 26-32. Https://Doi.Org/10.1016/J.Cosust.2018.07.002.

[3] Andersen, R. (2018). The United Nations Declaration On The Rights Of Peasants And Other People Working In Rural Areas. Journal Of Human Rights Practice, 10(1), 94–105. Https://Doi.Org/10.1093/ Jhuman/Huy003.

[4] Asian Farmers' Association [AFA]. (2016). Community Seed Banks: Experiences From Asia Under The Medium-Term Cooperation Program (MTCP2). Quezon City: AFA Publications.

[5] Bangladesh Agricultural Development Corporation [BADC]. (2018). Annual Report 2018. Dhaka: BADC.

[6] Bangladesh Agricultural Research Institute [BARI]. (2021). Annual Research Review 2021. Dhaka: BARI.

[7] Bangladesh Bureau Of Statistics [BBS]. (2023). Statistical Yearbook Of Bangladesh 2023. Dhaka: Government Of Bangladesh.

[8] Bangladesh Rice Research Institute [BRRI]. (2022). Annual Report 2022. Gazipur: BRRI.

[9] Choudhury, B., Saha, S., & Rahman, M. (2011). Nutritional Composition Of Indigenous Fruits In Bangladesh. Bangladesh Journal Of Agricultural Research, 36(3), 431–438. Https://Doi.Org/10.3329/ Bjar.V36i3.9277.

[10] Coomes, O. T., Mcguire, S. J., Garine, E., Caillon, S., Mckey, D., Demeulenaere, E., Élias, M. (2015). Farmer Seed Networks Make A Limited Contribution To Agriculture? Four Common Misconceptions. Food Policy, 56, 41–50. Https://Doi.Org/10.1016/J.Foodpol.2015.07.008.

[11] Food And Agriculture Organization [FAO]. (2018). The Role Of Community Seed Banks In Adaptation To Climate Change. Food And Agriculture Organization Of The United Nations.

[12] Food And Agriculture Organization [FAO]. (2019). The State Of The World's Biodiversity For Food And Agriculture. Rome: FAO.

[13] Frison, E. A., Cherfas, J., & Hodgkin, T. (2011). Agricultural Biodiversity Is Essential For A Sustainable Improvement In Food And Nutrition Security. Sustainability, 3(1), 238–253. Https://Doi.Org/10.3390/ Su3010238.

[14] Hossain, M., Jaim, W. M. H., Alam, M. S., & Rahman, A. (2015). Rice Biodiversity In Bangladesh: Adoption, Diffusion And Disappearance Of Varieties. Economic And Political Weekly, 50(25), 72–78.

[15] Intergovernmental Science-Policy Platform On Biodiversity And Ecosystem Services [IPBES]. (2019). Global Assessment Report On Biodiversity And Ecosystem Services. Bonn: IPBES Secretariat.

[16] Islam, M. S., & Hossain, M. I. (2015). Community Seed Banks And Farmers' Empowerment: The Case Of UBINIG And BARCIK In Bangladesh. Journal Of Agriculture And Environment For International Development, 109(2), 201–212. Https://Doi.Org/10.12895/Jaeid.20152.309.
[17] Jamil, I., & Hossain, A. (2019). Farmers' Seed Sovereignty And Resilience: Lessons From UBINIG And Community Seed Wealth In Bangladesh. Asian Journal Of Agriculture And Rural Development, 9(2), 139–150
[18] Jarvis, D. I., Hodgkin, T., Sthapit, B. R., Fadda, C., & Lopez-Noriega, I. (2011). An Heuristic Framework For Identifying Multiple Ways Of Supporting The Conservation And Use Of Traditional Crop Varieties Within The Agricultural Production System. Critical Reviews In Plant Sciences, 30(1–2), 125–176. Https://Doi.Org/ 10.1080/07352689.2011.554358.
[19] Louwaars, N. P., & De Boef, W. S. (2012). Integrated Seed Sector Development In Africa: A Conceptual Framework For Creating Coherence Between Practices, Programs, And Policies. Journal Of Crop Improvement, 26(1), 39–59. Https://Doi.Org/10.1080/15427528.2011.611277.
[20] New Age. (2025, Sept.). BADC Holds Workshop On Community Seed Bank, Adaptive Research.
[21] Rengalakshmi, R. (2016). Women And Seed Sovereignty: Insights From India. Feminist Economics, 22(1), 195–201. Https://Doi.Org/10.1080/13545701.2015.1088980.
[22] Shrestha, P., Rana, R. B., Subedi, A., & Vernooy, R. (2013). Community Seed Banks In Nepal: Past, Present, Future. Pokhara: LI-BIRD, USC Canada Asia, Oxfam, And IFAD.
[23] Sthapit, B., Shrestha, P., & Upadhyay, M. P. (2012). Emerging Theory And Practice Of Community Seed Banks: The Case Of South Asia. In Proceedings Of The National Workshop On Community Seed Banks. Pokhara: LI-BIRD.
[24] Sthapit, B. (2013). Emerging Theory And Practice: Community Seed Banks, Seed System Resilience And Food Security. In P. Shrestha, R. Vernooy, & P. Sthapit (Eds.), Community Seed Banks: Origins, Evolution And Prospects (Pp. 17–40). Bioversity International. Https://Www.Researchgate.Net/Publication/272972774
[25] Sthapit, B., Vernooy, R., & Shrestha, P. (2019). Supporting Community Seed Banks: Roles Of Key Stakeholders. Agriculture And Food Security, 8(1), 1–12. Https://Doi.Org/10.1186/S40066-019-0252-8.
[26] The Business Standard. (2025, Apr.). BADC And IRRI Launch Digital Tool; BADC Handles ~33% Of National Seed Supply.
[27] The Financial Express. (2025, Sept.). BADC Workshop On 'Community Seed Bank'.
[29] UBINIG. (2015, Nov. 8). Nayakrishi Seed Network; Seed And Genetic Resource Conservation.
[30] UBINIG. (2022, Nov. 14). Nayakrishi Farmers' Seed Preservation, Land Rights, And Women's Empowerment.
[31] UBINIG. (2024, Jan. 23). Nayakrishi As An Eco-Feminist Practice.
[33] Vernooy, R., Shrestha, P., & Sthapit, B. (2014). Community Seed Banks: Promoting Resilience And Improved Livelihoods. London: Routledge. Https://Doi.Org/10.4324/9781315767504.
[34] Vernooy, R., Shrestha, P., & Sthapit, B. (2017). Community Seed Banks: Origins, Evolution And Prospects. London: Routledge. Https://Doi.Org/10.4324/9781315543573.
[35] Vernooy, R., Shrestha, P., & Sthapit, B. (2020). The Role Of Community Seed Banks In Achieving Farmers' Seed Security: A Review Of Global Experiences. Development In Practice, 30(4), 468–479. Https://Doi.Org/ 10.1080/09614524.2020.1727415.
[36] Vernooy, R., Shrestha, P., & Sthapit, B. (2024). Community Seed Banks For Climate Adaptation: A Global Review. Sustainability, 16(2), 866. Https://Doi.Org/10.3390/Su16020866.
[37] Women-Led CSB Case: FAO GLIS / Actionaid Bangladesh. (N.D.). Women-Led Community Seed Bank.
[38] World Bank. (2021). Project Appraisal Document: Program On Agricultural And Rural Transformation For Nutrition, Employment, And Resilience (PARTNER). Washington, DC: World Bank.