

Gender, Climate Vulnerability, and Technology Adoption: An Assessment of Agricultural Microenterprises in Rural Bangladesh

ID: 206

Aniruddha Roy Protya^a, Sujan Banik^a, Provat Kumar Saha^b, Sabiha Yeasmin Rosy^c, Mohammad Golam Kibria^d, Yushiou Tsai^e and Md Aman Uddin^a

^aDepartment of Mechanical Engineering, Bangladesh University of Engineering and Technology, Dhaka-1000, Bangladesh

^bDepartment of Civil and Environmental Engineering, University of Washington, Washington, United States

^cDepartment of Women and Gender Studies, University of Dhaka, Dhaka-1000, Bangladesh

^dDepartment of Soil Science, Bangladesh Agricultural University, Mymensingh-2202, Bangladesh

^eThe ByWater Institute, Tulane University, New Orleans, LA, USA



**8th Industrial Engineering &
Operations Management
Conference - Bangladesh**
Dhaka, December 20-21, 2025
Host: World University of Bangladesh (WUB)

Background and Motivation

**Microenterprises
(MEs)**

Poultry

Horticulture

Aquaculture

Small scale

Rely on informal finance

**Women comprising over 50% of
agricultural workforce**

Threats of climate change

**Underexplored Emerging Tech in
Bangladesh**

**Sensors & weather data
optimization**

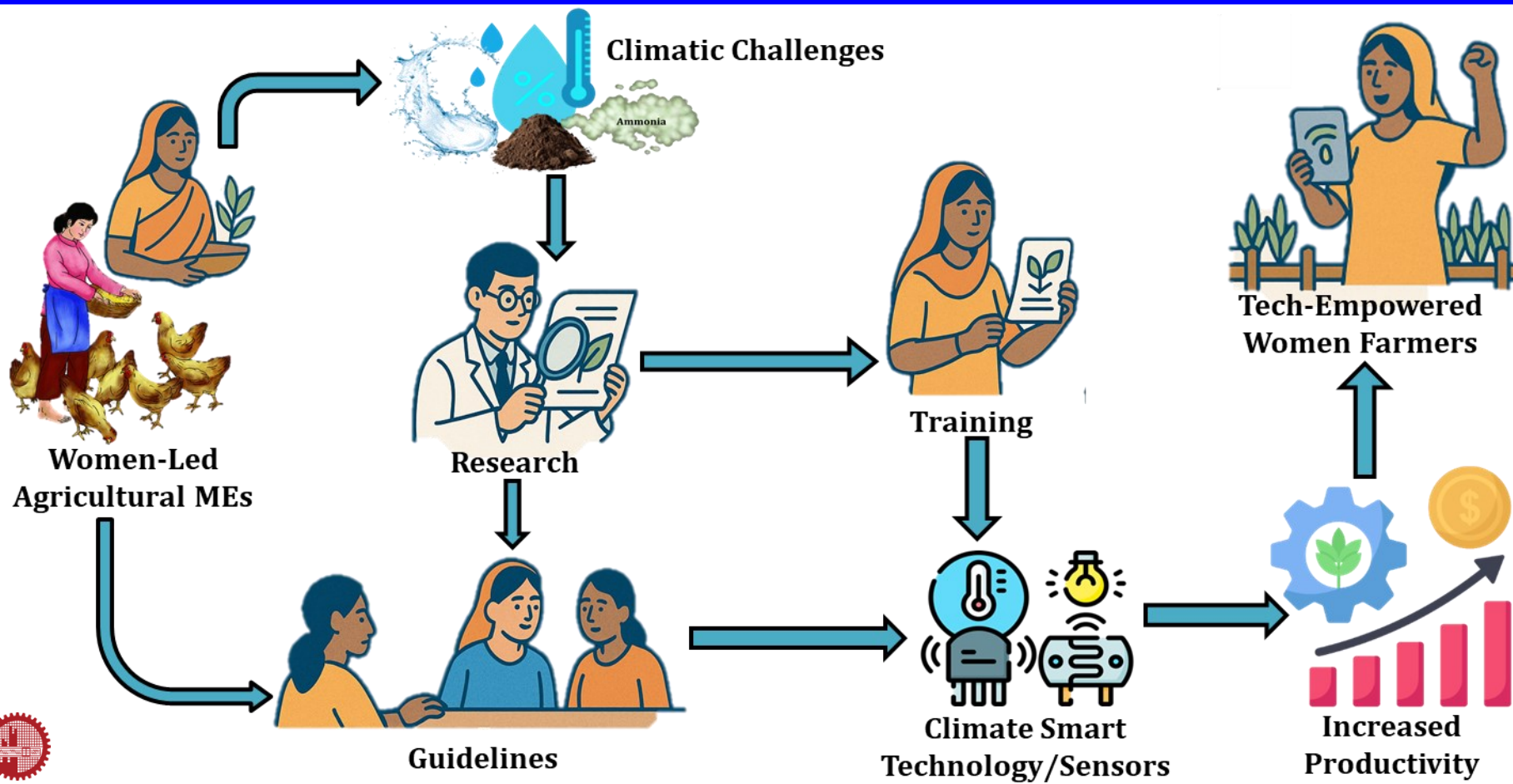


Objectives

- ❖ To **evaluate** how **climate change** affects **rural agriculture** in Bangladesh and compare gender dynamics across the **Poultry, Horticulture, and Aquaculture** sectors.
- ❖ To identify the **most vulnerable women-led sector** for further study and intervention.



Overview



Methodology & Sample Overview

Survey Location

- Poultry: Joypurhat, Naogaon, Dinajpur, Gazipur & Tangail
- Horticulture & Aquaculture: Jashore, Satkhira (South-West)

Sample Size

- Total MEs surveyed: **427**
- Poultry: 61% Female
- Horticulture: 77% Female
- Aquaculture: 50% Female

Key Informant Interview (KIIs) & Focus

- KII Conducted: 10 key informants (Agri & Gender experts, NGOs & Local Govt.)
- Focus: Ownership, decision-making, weather challenges, access to tech



Field Visits/Survey in Poultry Sector



Photo: Typical Semi-open Broiler chicken Farm in Bangladesh

Location: Kapashia, Gazipur

Date of capture: 13.05.2025



Photo: Brooding time ("initial period after hatching") of broiler chicks (Death rate due to cold shock (winter) is high at this time)

Location: Hili, Dinajpur;

Date of capture: 18.02.2025



Photo: Brooding time of Sonali chicks

Location: Jamalganj, Joypurhat Sadar

Date of capture: 13.02.2025



Field Visits/Survey in Poultry Sector



Photo: Mr. Tajrul and Mrs. Shiuly, facing losses due to **lack of concern about ammonia gas** formation during winter.

Location: Joypurhat Sadar

Date of capture: 16.02.2025



Photo: Survey of Mrs. Jahanara Begum, a poultry farmer with 10 years of experience in Sonali and Broiler farming, **facing challenges of heat and cold shock during brooding** without precautions against extreme weather events.

Location: Jamalganj, Joypurhat Sadar

Date of capture: 12.02.2025

Field Visits/Survey in Horticulture Sector



Photo: Survey of Mrs. Sanchita Rani, a pointed gourd cultivator, reveals that she adopted integrated cultivation systems five years ago. She shares insights on **pest management and optimal harvesting times**, which have been **crucial for her sustained profitability**.

Location: Panishara, Jashore

Date of capture: 23.02.2025



Photo: Survey of Mrs. Asma Khatun, a prominent woman, who has built her own Garbera sheds by **primarily taking small loans from banks**, making herself a hard-working and dedicated farmer who **inspired lots of women** who have taken flower farming by watching her sail.

Location: Godkhali, Jhikargacha, Jashore

Date of capture: 27.02.2025

Field Visits/Survey in Aquaculture Sector



Photo: The use of aerators in pond aquaculture has become increasingly beneficial, as they **enhance oxygen levels and reduce heat stress**, which are essential for maintaining healthy fish populations.

Location: Moynarbag, Jashore;

Date of capture: 28.02.2025



Field Visits/ Survey in Aquaculture Sector



Photo: Mrs. Sanchita Saha highlighted the increasing **unpredictability of weather patterns** as a major challenge for freshwater prawn cultivation.

Location: Monirampur, Jashore

Date of capture: 02.03.2025



Photo: Mr. Nazmul Huda faces increasing **difficulties in managing water temperature fluctuations** and dissolved oxygen levels.

Location: Monirampur, Jashore

Date of capture: 03.03.2025

Results and Discussions



Experts Insights from KII



Support needed: Training & tech aid for rural sensor use.



Women-inclusive design: Tailor tech to fit local women's roles & constraints.



Partner with NGOs to offer hands-on training (flexible timing/locations).

❑ Technology Focus by Sector:



Poultry: Sensors (**Temperature, Humidity, NH_3**), weather forecasting & automation support.



Horticulture: Sensors (**Temperature, Humidity, Soil Nutrients**), weather forecasting.



Fisheries: Sensors (**Temperature, pH, BOD, NH_3**), weather forecasting.



Major Findings Regarding Survey

Location-wise Gender Dynamics

- ✓ South-West (Horticulture & Aquaculture): Equal participation in horticulture, but men dominate ownership/decisions; women participate more in post-harvest activities; aquaculture is male-dominated.
- ✓ North-West (Poultry): Women have stronger participation and ownership compared to the South-West's other sectors.

Sector-Specific and Gender-Based Observations

- Poultry: High female participation, but challenges in profit control.
Key issues: Feed costs, weather. Need for technology/training.
- Horticulture: Significant female participation, but limited ownership/decision-making.
Key issues: Pests, diseases, market access; weather (for flower farming).
- Aquaculture: Lower female participation (cultural/physical barriers).
Key issues: High feed costs, climate change.

Rationale for Selecting a Sector (Poultry)

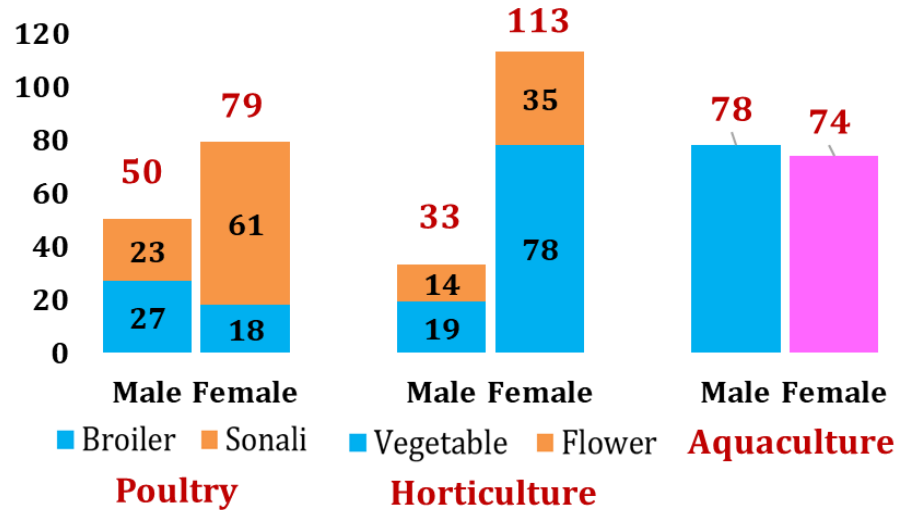


Fig. Survey Participants

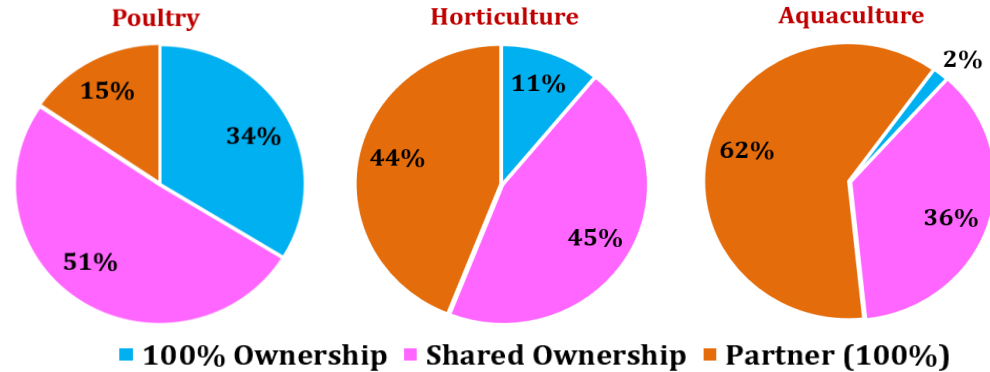


Fig. Ownership Breakdown

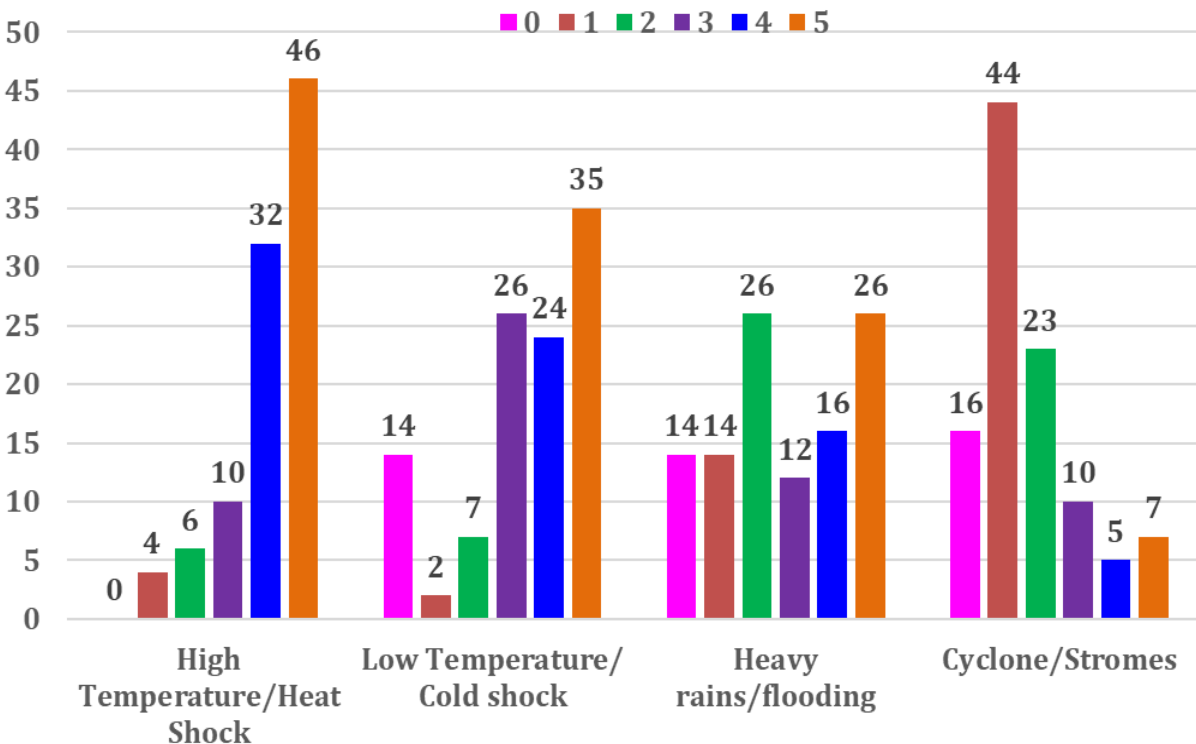
- High female involvement (61%, 4-6 hours/day).
- Significant ownership (34% full, 51% shared).
- Active in decision-making (69% shared) & contribute to family and children's expenses.
- Very vulnerable to extreme weather.
- Fast production cycle (30 days).

Degree of Impact of Extreme Weather

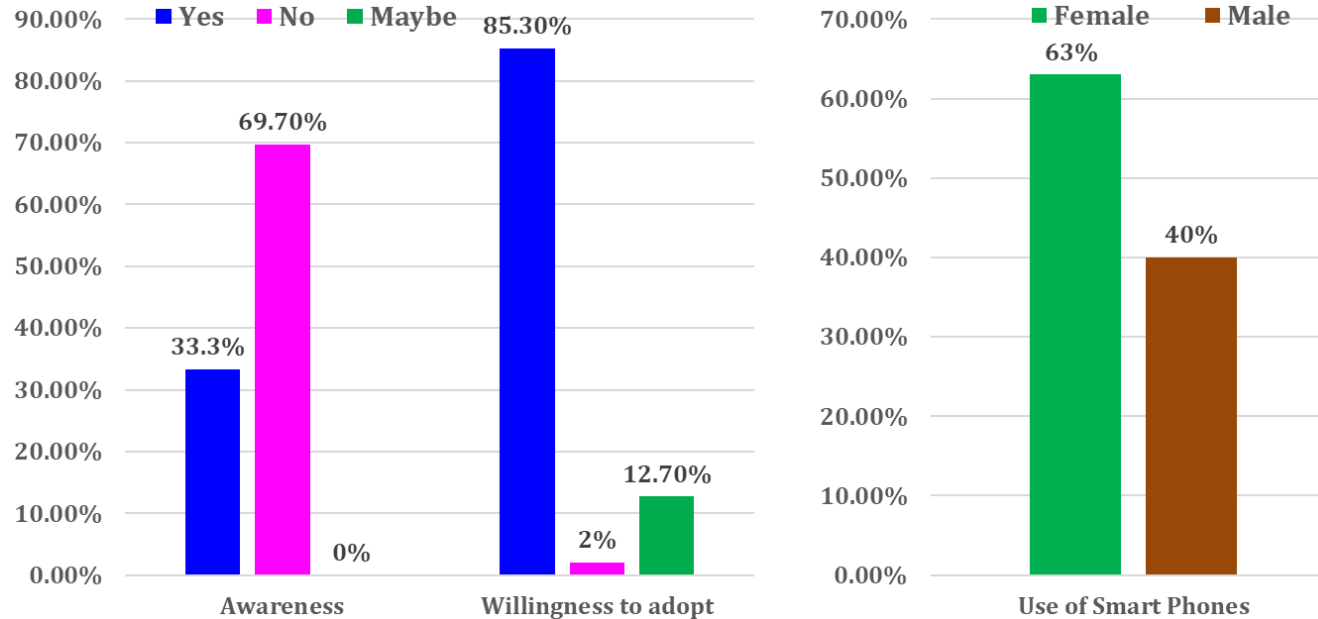
☐ Summer heat causes **high broiler** mortality due to **heatstroke**.

☐ In winter, covered farms lead to **NH₃ gas buildup**. Many farmers are **unaware of ammonia gas** risks.

☐ **Sonali chickens**, though **resilient to heat**, experience higher mortality rates due to cold shock, especially during brooding.



MEs Perception on Weather Related Technology



- ☐ A significant majority of MEs are **not aware of weather-related technology**, however, **strong willingness to adopt it**.
- ☐ A larger proportion of **Women** use smartphones → **leverage for training**.
- ☐ As social norms limit women's training access, this project offers **community-based NGO training at women-friendly times**.

Technical and Social Innovation

- Tech & training: **Tailored to women's needs** (easy to use, accessible).
- Provide **affordable sensors** (e.g., Temperature, Humidity, Ammonia, Water pH, Brightness/LUX).
- Leverage women's smartphone use for **crucial weather alerts & farming info.**
- **Boost women's farm decisions, market access, & overcome social mobility barriers.**



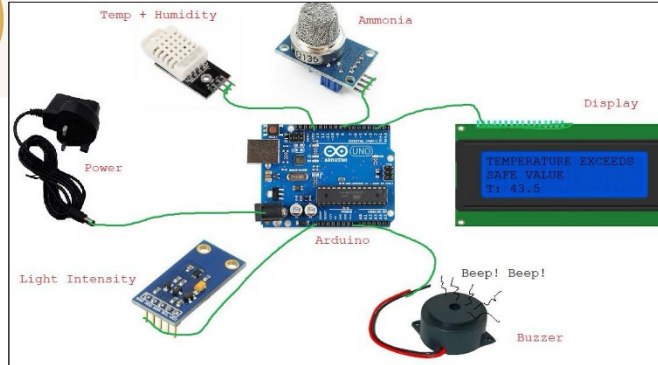
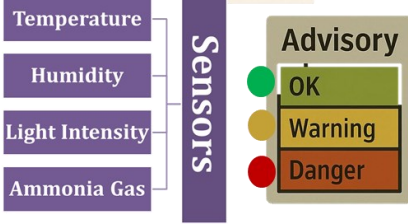
Conclusion

- In **poultry** sector, MEs face problems for **heat and cold stresses and high humidity levels**, which cause increase in death rates and productivity.
- In **horticulture**, **flooding, high heat, soil quality and pest management** are the major problems. And for **aquaculture** sector, **managing temperature, ammonia and oxygen levels** are the major problems.
- Finally, **poultry sector has been selected** for the future study due to **higher vulnerability due to extreme weather events** and **participation of women** regarding ownership and decision-making is **higher** compared to other two sectors.



Future Scope

TEMP 37.0°C
HUMIDITY 65%
LIGHT 270 lx
AMMONIA 8 ppm



- ❖ If the technology tests out well and gives us good results, our goal for a future project is to create a complete "smart farm" system specifically designed for women in rural Bangladesh.

Acknowledgement

- ❖ The authors gratefully acknowledge the financial support through Grant ID: INV-074712 from the Gates Foundation.



References

1. SMEs in Bangladesh: Institutional Challenges and Government Support." August 2022. Accessed October 17, 2024. https://www.cipe.org/wp-content/uploads/2022/08/SMEs-in-Bangladesh_Report_August-2022.pdf
2. Small and Medium Enterprise (SME) Credit Policies & Programmes. Dhaka: Bangladesh Bank, 2016
3. Jasra, J.M., Khan, M.A., Hunjra, A.I., Rehman, R.A.U. & Azam, R.I. (2011). Determinants of business success of small and medium enterprises. International Journal of Business and Social Science, 2(20):274–280.
4. James R. B., Tong L., Wenling L., Triphon P., and Glenn Y. (2008). Capital Access Index 2007: Best Markets for Business Access to Capital. Santa Monica: Milken Institute.
5. "Newsletter on Microenterprises: April 2016." Dhaka: InM, 2016. Accessed October 17, 2024. https://inm.org.bd/wp-content/uploads/2015/09/Newsletters_1_April_2016.pdf
6. Center for Governance Studies. Small and Medium Enterprises in Bangladesh: An Assessment Report. July 2022. Accessed October 17, 2024. <https://cgs-bd.com/cms/media/documents/43c6b6e8-a0f3-4504-a7b6-828a46801d01.pdf>
7. International Cooperation Organization for Small and Medium Enterprises in Asia (ICOSA). "Report on Small and Medium Enterprises in Asia." Japan: ICOSA, 2019. Published in The Daily Star, September 30, 2019.
8. World Bank. "Micro-Enterprise Owners in Bangladesh Go Green." September 6, 2022. Accessed October 17, 2024. <https://www.worldbank.org/en/results/2022/09/06/micro-enterprise-owners-in-bangladesh-go-green>
9. Bangladesh Bureau of Statistics. Preliminary Report on the Population and Housing Census 2011. Dhaka: Bangladesh Bureau of Statistics, 2013. Accessed October 17, 2024. https://bbs.portal.gov.bd/sites/default/files/files/bbs.portal.gov.bd/page/f2661853_b857_49c5_8761_e1641e3aec9b/Pre_Report_Econo_Cen_13.pdf
10. Financial Express. "Female Entrepreneurship in Bangladesh." Accessed October 17, 2024. <https://thefinancialexpress.com.bd/views/reviews/female-entrepreneurship-in-bangladesh-1553181544>
11. GrowthLogix Consultants. "Women Empowerment: Catalysing Social Culture and Driving Business Development." Last modified June 27, 2023. <https://growthlogixconsultants.com/2023/06/27/women-empowerment-catalysing-social-culture-and-driving-business-development/>
12. IDLC Finance Limited. IDLC Monthly Business Review, March 2018. Accessed October 25, 2024. <https://idlc.com/mbr/article.php?id=95>
13. Bangladesh Trade Portal. Women Entrepreneurship Development in Bangladesh. Accessed October 17, 2024. <https://www.bangladeshtradeportal.gov.bd/kcfinder/upload/files/WomenEntrepreneurshipDevelopment.pdf>
14. Rahman, S M Shahidullah. "Women Far Behind Men in Financial Inclusion Thru MFS." The Daily Star. July 2, 2023. <https://www.thedailystar.net/business/economy/news/women-far-behind-men-financial-inclusion-thru-mfs-3562931>
15. Chakma, K., & Ruba, U. B. (2021). Role of Bangladeshi Women in Diverse Agricultural Production: A Review. European Journal of Agriculture and Food Sciences, 3(3), 1–5. <https://doi.org/10.24018/ejfood.2021.3.3.284>

Thank You

