



Empowering Women in Dairy Farming: Gender Roles, Challenges and Climate Smart Practices in Southern Bangladesh

Mohammad Moziball Hoque¹, Rinki Akter¹, Uswatun Hasana Hashi², Md. Abdul Karim³

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ABSTRACT

Background: Women play a critical role in both household management and agricultural production in rural Bangladesh. In Dumuria Upazila, Khulna district, it is well known that women dairy farmers contribute significantly to household income and food security. However, they face socio-economic and gender-based barriers that affect their access to resources, decision-making power and adoption of modern technologies. This study explores gender roles, access to credit, ownership perception and the adoption of climate-smart agricultural practices among women dairy farmers, who spend their time mostly on the farming.

Methods: A qualitative interview for gender analysis was conducted among 133 women dairy farmers selected from a broader population of 3,050 women aged 20 to 89 years in Dumuria Upazila of Khulna district. The family income of those farmers comes mostly from dairy farming. Data were collected through 12 Key Informant Interviews (KIIs) and 3 Focus Group Discussions (FGDs) on demographics, household size, educational background, farming experience, access to credit, financial and decision-making involvement, asset perception and adoption of climate-smart technologies. The responses were analyzed to understand the gender dynamics and socio-economic conditions affecting the livelihood of those women.

Result: The higher number of the respondents (44 farmers, 33%) were aged between 30-49. Women managed both household and farming responsibilities, with family sizes ranged from 2 to 10 members and dairy farming experience ranging from new entrants to over 30 years. Educational attainment varied. Only 35 (26.31%) respondents had access to credit. Nevertheless, women showed increasing involvement in financial decisions and milk distribution. Although most assets were officially registered in their husbands' names, 131 (98.50%) women perceived the assets as their own. Joint decision-making in income management was common, though in households with elders or in-laws decisions were largely elder-driven. Regarding climate-smart technologies, only 14 (10.5%) respondents acknowledged familiarity. Nine (6.77%) used biogas plants and two used biogas combined with vermi-composting. Other mentioned to include rubber mats, water pumps and fans suggesting unintentional use of such technologies. However, 64 (48%) respondents were unaware, 53 (39.85%) marked "N/A" and one responded negatively, highlighting a major awareness gap in climate-smart farming practices. It was concluded from the findings that while women in dairy farming are increasingly participating in financial and household decision-making, their formal financial empowerment, such as buying assets in their names or opening fixed deposit in bank and access to climate-smart technologies remain limited, with a significant awareness gap in sustainable farming practices underscoring the need for targeted education and support interventions.

Key words: Decision making, Ownership, Women dairy entrepreneur.

INTRODUCTION

Globally the livestock profession is considered as a highly dynamic and prospective sector (Ahlawat *et al.*, 2025; Liu *et al.*, 2023). A sustainable dairy farming of a country is dependent on a holistic approach by integrating environment friendly management (Doubbi *et al.*, 2025) and efficient value chain approach. As an agrarian country, livestock sector plays a vital role to the progressing economy of Bangladesh.

Approximately 20% of Bangladesh population is entirely dependent on livestock, while 75% of rural residents do the same (Sarma, 2024; Uddin *et al.*, 2016). In 2023-24, the livestock sector of Bangladesh contribute almost 1.80% of the total Gross Domestic Product (GDP). Milk production in Bangladesh is estimated 15.44 M Metric Ton and meat production 9.23M Metric Ton (BBS 2023-24). Women in Bangladesh are primarily engaged in homestead agriculture, which includes raising poultry, homestead farming and dairy farming in rural areas. The selling of dairy products is a crucial source of income which resolves financial difficulties in households (Begum *et al.*, 2019). It is

¹Solidaridad Network Asia, House# 32, Road 10A, Dhanmondi, Dhaka-1209, Bangladesh.

²Department of Agricultural Science, Daffodil International University, Savar, Dhaka.

³College of Agricultural Sciences, International University of Business Agriculture and Technology, Uttara Model Town, Dhaka, Bangladesh.

Corresponding Author: Md. Abdul Karim, College of Agricultural Sciences, International University of Business Agriculture and Technology, Uttara Model Town, Dhaka, Bangladesh.
Email: akarim1506@gmail.com

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a great source of poverty reduction by empowering and lifestyle changing of rural women. The importance of women

in nutritional and health status of their family has long been acknowledged in the research on intra-household allocation (Ghosh *et al.*, 2021; Thomas, 1990; Haddad and Hoddinott, 1994). Similarly, the connections between nutrition and agriculture are significantly influenced by women participation (Ruel and Alderman, 2013; Kadiyala *et al.*, 2014).

In a patriarchal society like Bangladesh, the women have been engaged directly to family agricultural activities since age old, but their roles are not well recognized. In Dumuria, Upazilla of Khulna district, many women are engaged in dairy farming and some of them have emerged as dairy entrepreneur. Their participation in dairy sector supports the statement of Rinkal *et al.* (2004) and Ghosh *et al.* (2021) that women now vary from the women in the past in a number of ways. Women nowadays are willing to take risks in order to achieve social and economic independence. Women engagement in agricultural activities are typically driven by their family's circumstances and the need to secure their future. However, in Bangladesh the role of women in agriculture and overall social upliftment is not well documented. Therefore, this study aimed to identify gender-specific opportunities and constraints in empowering women in dairy farming in Southern Bangladesh.

MATERIALS AND METHODS

The gender analysis was done following a comprehensive methodology by taking a wide range of both quantitative and qualitative data on women's experiences in the dairy value chain.

Survey areas

The selected locations were Bagachra, Boyarsing, Gajendrapur and Shovna Unions of the Dumuria Upazilla under Khulna district of Bangladesh for quantitative surveys during September through December 2022. Qualitative interviews offered a deep dive into the diverse roles, experiences and perspectives that compose the dairy value chain across three distinct areas such as Kulbaria, Mirzapur and Shovna under the Dumuria Upazilla.

Quantitative surveys

To gather structured quantitative data, surveys were conducted by undertaking personal interview with 133 dairy farmers including 125 women and 8 men since the women dairy farmers outnumber the men. The sample size was determined based on a confidence level of 90% and a 10% margin of error from the total dairy farmer population size of 3050 farmers in the area. This representative sample aimed to ensure statistically significant and robust results that reflect the broader population.

Qualitative interviews

A total of 12 Key Informant Interviews (KIIs) and 3 Focus Group Discussions (FGDs) were conducted, enriching our understanding with the granularity of firsthand experiences.

Key informant interviews (KIIs)

A diverse range of stakeholders from Kulbaria, Mirzapur and Shovna were interviewed under KII. These included 8 interviews with female dairy farmers 4 interviews with male dairy farmers, while 2 interviews were held with male owners of milk collection centers. Besides, a single male milk collector was interviewed, alongside 2 female community mobilizers, 2 male fodder suppliers and a male Community Livestock Service Provider (CLSP).

Focus group discussions (FGDs)

Across these three areas, 3 FGDs were organized to facilitate comprehensive discussions. One FGD comprised 8 male dairy farmers, while two separate FGDs were held for female participants, one consisting of 7 members and another with 8 participants. These discussions offered a platform for a collective exchange of experiences and perspectives within the dairy value chain.

The geographical specificity of Kulbaria, Mirzapur and Shovna allowed for a nuanced understanding of the regional dynamics within the dairy sector. The diverse composition of interviewees ensured a comprehensive exploration of gender-specific roles and experiences, contributing significantly to our insights into the complexities of the dairy value chain in these areas.

Sampling

As mentioned above, a purposive sampling strategy was employed to ensure the inclusion of a diverse cross-section of participants relevant to the study's objectives.

Data collection instruments

A series of well-structured questionnaires for the mentioned interviews were developed for quantitative surveys, FGDs and KIIs, designed to elicit detailed information on various aspects of gender and dairy farming.

Ethical considerations during data collection

Throughout the data collection process, ethical considerations to keep secrecy of their personal information were maintained. Several measures, such as keeping the interviewed documents within the custody of the researchers were maintained to safeguard participant rights and ensure ethical practices, such as.

Informed consent

Prior to participation in surveys, FGDs and KIIs, participants were provided with detailed information about the study's objectives, their roles and the use of collected data. Informed consent was obtained from each participant, emphasizing voluntary participation and the right to withdraw at any stage without repercussion.

Respect for participants

Participants' perspectives and experiences were valued and respected throughout the data collection process.

Data analysis

Quantitative analysis

Quantitative data were collected using Google Forms and processed using Excel to conduct general statistical analysis, identifying key patterns and findings relevant to the study's objectives.

Qualitative analysis

Thematic analysis of the qualitative data gathered from KIs and FGDs was used to understand the nuanced perspectives and experiences.

Quality control

Rigorous steps were taken for quality control including meticulous double-checking during data entry, standardized coding and systematic data cleaning. Additionally, data validation was conducted through cross-referencing with reliable secondary sources.

The methodology outlined here provided a robust framework for conducting the gender analysis, ensuring that the findings were comprehensive, reliable and capable of informing strategic interventions for gender inclusivity within the dairy value chain.

RESULTS AND DISCUSSION

Fig 1 describes the number of respondents against the age range from 20 to 89 year old women. Here 44 respondents (33%) found the highest number whose ages were between 30 to 49 years followed by 50-59, 20-29 and 60-69. This study paints a picture of those women, who range from young adults embarking on their careers to seasoned elders with a lifetime of experience. The age distribution chart accompanying this text provides a visual representation of this age diversity, underscoring the cross-generational transfer of dairy farming knowledge and practices.

Managing both household responsibilities and dairy farms is a significant undertaking by many women in this region (Cesaroni and Paoloni, 2016). Family sizes vary considerably, with households comprising diverse structures. Fig 2 is the distribution of household sizes that reflects this variety, ranging from 2-member families to those with up to 10 members (7.5%).

The tenure of these women in dairy farming spans from novices to experts with decades of dedication, as shown in the years of experience chart in Fig 3. This range is indicative of a rich repository of knowledge, with most women having been in the sector for 10 to 30 years; and with 11-20 years 36% and 21-30 years 26%. Such a substantial base of experience suggests a strong, knowledgeable workforce upholding the dairy farming industry.

Educational backgrounds among these women span a wide range, from no formal education to higher academic achievements. This diversity is integral in shaping a blend of traditional and modern farming methods, as reflected in the educational background chart below Fig 4. The 74% of the respondents have a secondary education level, 30%

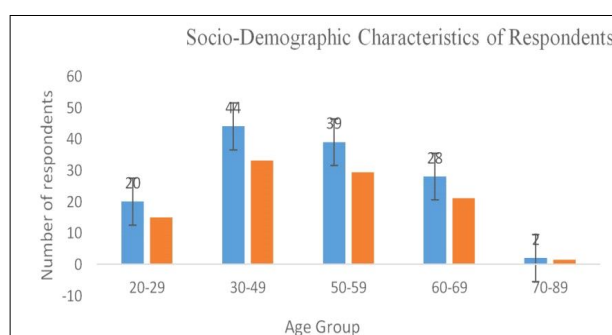


Fig 1: Socio-demographic characteristics of respondents on age group.

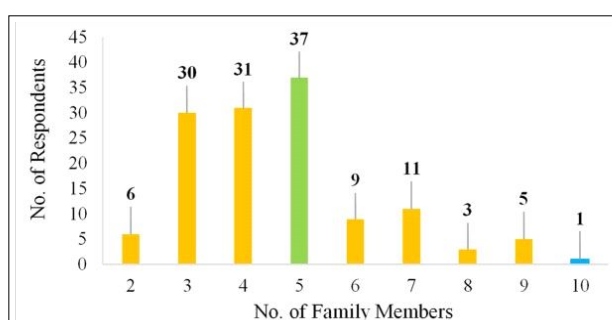


Fig 2: Socio-demographic characteristics of respondents on household size.

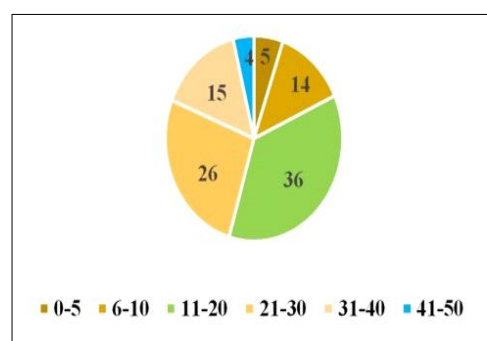


Fig 3: Socio-demographic characteristics of respondents (%) on years of dairy farming experiences.

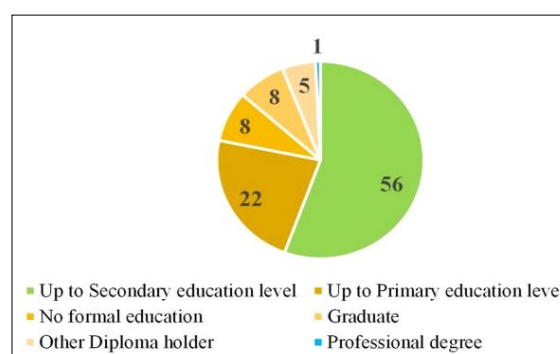


Fig 4: Socio-demographic characteristics of respondents (%) on educational attainment.

have primary education level and only 1% achieved a professional degree.

Cow management has traditionally been part of women's roles in these communities, merging naturally with other household chores. The importance of dairy farming extends beyond tradition; it is also an economic necessity for many families, often contributing significantly to household incomes (Bullock and Crane, 2021). In essence, dairy farming in Dumuria Upazilla transcends being merely an economic activity; it's a way of life where women occupy central roles. It embodies a confluence of tradition, economic necessity and community strength, with women at its core.

Women in South Asia receive fewer than 10% of commercial loans, making them essentially invisible to official financial institutions (Sinha, 2005). The scenario is more or less the same in recent years. From the survey we found that women are accessing credit to support their dairy enterprises, with 35 out of 133 (26%) respondents taking loans for business purposes as shown in Fig 5. The majority (98; 74%) did not take any loans. Access to credit allows women to invest in their dairy businesses, although scope remains for improvement through facilitating linkages with formal financial institutions. Women, who traditionally had limited financial decision-making, are now actively involved in the sale and distribution of milk (Savani and Stewart, 2019).

In Fig 6, out of the total 133 respondents 75 (56%) reported jointly managing income from dairy farming with their spouses or partners, highlighting a prevalent trend of collaborative financial decision-making within households. This joint management signifies shared responsibilities and mutual discussions about fund allocation and usage.

In Fig 7, a deeper exploration during Focus Group Discussions (FGDs) and Key Informant Interviews (KIs) unveiled an intriguing insight regarding the perception of

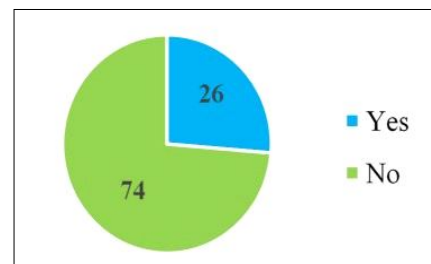


Fig 5: Access to credit of the respondents (%).

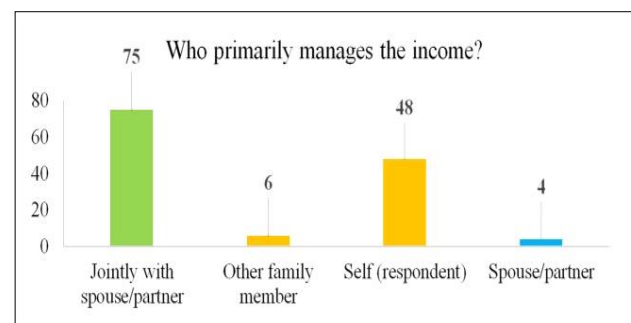


Fig 6: Income management by the family members.

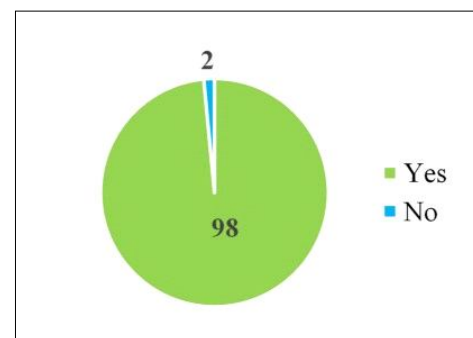


Fig 7: Asset ownership of women in dairy farming (%).

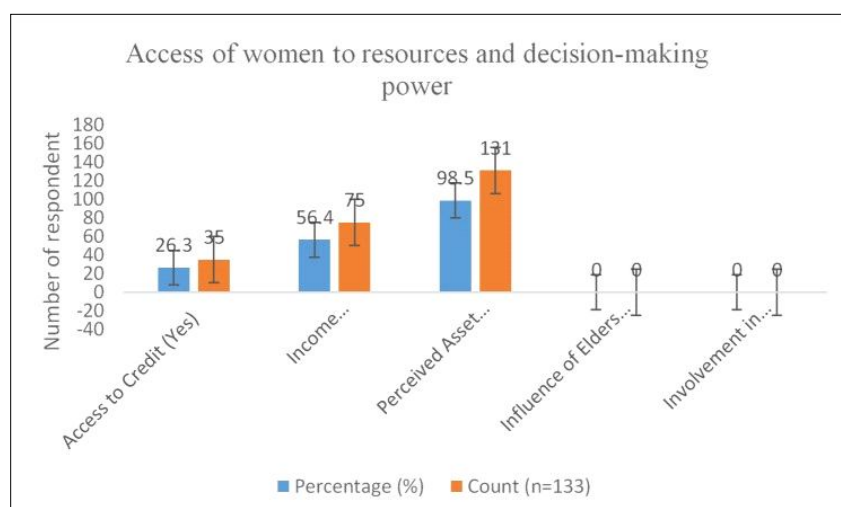


Fig 8: Access to resource and decision making power of the dairy farming women.

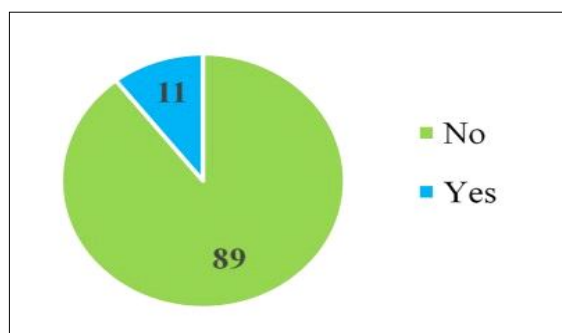


Fig 9: Familiarity (%) with climate smart livestock technologies of farming women.

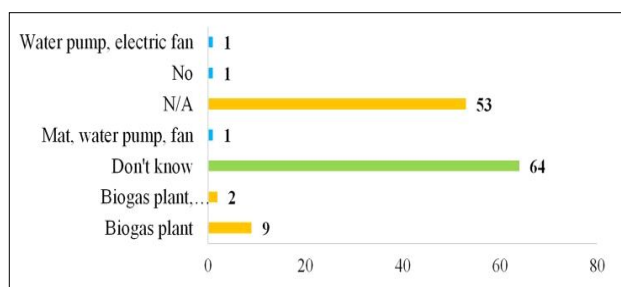


Fig 10: Types of climate-smart technologies adopted by respondents.

asset ownership among women within these households. It was revealed that although these assets were registered in the name of their husbands, 131 (98%) respondents, predominantly women, regarded these assets as their own. Notably, major decisions pertaining to asset purchases were commonly made jointly by spouses. However, in practice, the management of funds and the legal ownership of these assets remained under the name of their husbands. This revelation unveils a complex scenario where despite joint decision-making, financial control and legal ownership predominantly reside with husbands, influencing the perceived disparity in asset ownership between men and women within the surveyed cohort (Savani and Stewart, 2019).

The data on decision-making dynamics within dairy farming households reveals an interesting trend. A significant majority (98.5%) of respondents noted that they jointly make decisions with their spouses regarding the management of income generated from dairy farming (Fig 8). However, this trend shifts in cases where respondents live with their in-laws or elderly members. According to Key Informant Interviews (KIIs), it was highlighted that in such scenarios, decision making tends to be influenced or led by the elders. Additionally, discussions from Key Informant Interviews (KIIs) and Focus Group Discussions (FGDs) emphasize the active involvement of women in community-level decision. Their proximity and involvement in neighborhood activities enable their participation in communal affairs, particularly in decisions related to dairy farming.

The study with 133 respondents indicated a striking discrepancy in their awareness of climate-smart practices

(Fig 9). A mere 14 (10.5%) individuals acknowledged familiarity, while 119 (89%) admitted lacking of awareness. However, a more in-depth exploration during Key Informant Interviews (KIIs) and Focus Group Discussions (FGDs) uncovered the fact that despite the initial lack of recognition, women were found to be actively implementing climate-smart technologies on their farms without identifying them.

Fig 10 represents the distribution of specific climate-smart technologies adopted by the respondents. Nine respondents (6.8%) mentioned using a Biogas plant, while two mentioned Biogas plants along with vermicomposting. Surprisingly, 64 (48%) respondents admitted that they did not know well about climate-smart technologies, indicating a significant gap in awareness. Additionally, one respondent mentioned of using a rubber mat, water pump, fan, or a water pump and electric fan, indicating their unintentional adoption of climate-smart approaches without realizing it. Moreover, 53 (40%) respondents indicated "N/A" and one responded negatively, that further highlighting the varied understanding of these practices among the surveyed group.

CONCLUSION

A comprehensive study was conducted to understand the gender roles, access to credit, ownership perception and the adoption of climate-smart agricultural practices among women dairy farmers of different locations of Dumuria Upazilla of Khulna district of Bangladesh. The findings revealed that women managed both household and farming responsibilities. Their dairy farming experience varied from new entrants to over 30 years. The dairy farmed women showed increasing involvement in financial decisions and milk distribution. Although most assets were registered in their husbands' names, 98.50% women perceived the assets as their own. Joint decision making in income management was common, though in households with elders or in-laws, decisions were largely elder-driven. Regarding climate-smart technologies, only 10.5% respondents acknowledged familiarity of which 6.77% used biogas plants and two used biogas combined with vermi-composting, few used rubber mats, water pumps and fans. However, 48% respondents mentioned that they were unaware, 40% marked "N/A" and one responded negatively. Therefore, despite increasing participation of women in dairy farming, their financial and household decision-making, access to climate-smart technologies remain limited, which demands for government support.

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Disclaimers

The views and conclusion expressed in this article are solely those of the authors and do not necessarily represent

the views of their affiliated institutions. The authors are responsible for the accuracy and completeness of the information provided, but do not accept any liability for any direct or indirect losses resulting from the use of this content.

Informed consent

All the information collected from the project area was primarily well informed to and agreed by the management of Solidaridad Network Asia (SNA).

Conflict of interest

The authors declare that there is no conflicts of interest regarding the publications of this article. No funding or sponsorship influenced the design of the study, data collection, analysis, decision to publish, or preparation of the manuscript.

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