

**Food Security and Social Entrepreneurship:**  
**An Investigation into the Bangladesh Agripreneurial Ecosystem**

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## **Abstract**

Food security has remained a global concern since the world food crisis of the 1970s, focusing on ensuring sufficient food for marginalized populations. Including those experiencing poverty, vulnerability, women, and children. As a mission-driven business phenomenon, social entrepreneurship plays a pivotal role in society by integrating economic activities through small, and medium enterprises. Entrepreneurs leverage networks to address social problems, including the interplay between food security, economic growth, and the development of social entrepreneurship within an entrepreneurial ecosystem. This study examines the potential of social entrepreneurship in promoting sustainable regional food production to achieve food security, with a specific emphasis on appropriate models for the small agribusiness sector in Bangladesh, a developing country.

The data collection for this study involved Zoom and telephone interviews, archival research, and a field visit to research sites in Bangladesh. Interviews were conducted with milk and beef farmers, government officials, NGOs, and private organizations, revealing shared goals and unique financial services through public-private collaborations. However, the findings underscored the challenges most milk and beef farmers face in enhancing food security, which affects socioeconomic conditions and well-being of the farmers. In addition, farmers require improved access to finance and increased cohesion among financial service providers.

The study identifies issues relating to the accessibility of finance and timely provision of opportunities for promoting food security. Furthermore, it emphasizes the significance of sustainable production practices in achieving food security and enhancing household welfare through social entrepreneurship. Addressing these challenges necessitates policy changes that target the underlying causes of difficulties in loan disbursement in rural areas. This entails improving policies, legislation and taking necessary actions to mitigate the impact of climate conditions and corruption. Public-private partnerships and joint ventures emerge as potential solutions to reduce the high costs of loan disbursement and enhance food security, income, and economic well-being in rural areas.

**Keywords:** Food Security, Social Entrepreneurship, Entrepreneurial Ecosystem, Bangladesh



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## LIST OF ABBREVIATIONS

ADB	Asian Development Bank
ASA	Association for Social Advancement
BBS	Bangladesh Bureau of Statistics
BD	Bangladesh
BMET	Bureau of Manpower and Employment and Training
BRAC	The Bangladesh Rural Advancement Committee
Bor	Borhanuddin
CGIAR	Consortium of International Agricultural Research Centers
COVID-19	Coronavirus Disease of 2019
CPI	Corruption Perception Index
CRI	Climate Risk Index
DAE	Department of Agricultural Extension
DC	Dairy Cow
DLO	District Livestock Office
DLS	Department of Livestock Services
E/F	Financial Sunspot of Entrepreneurial Ecosystem
E/S	Sunspot of Entrepreneurial Ecosystem
FAO	Food and Agriculture Organization of the United Nations
FS	Food Security
FSI	Food Security Index
GB	Grameen Bank
GFSI	Global Food Security Index
gm	Gram
Gob	Gobindaganj
Govt.	Government
Ha	Hectare
HIES	Household Income and Expenditure Survey
ICT	Information and Communication Technology
IPC	Integrated Food Security Phase Classification
Ltd	Limited
mg/L	Milligrams per liter
ml	Milliliter
NGO	Non-Governmental Organization
Org	Organization
PKSF	Palli Karma Sahayak
PRISMA	Preferred Reporting Items for Systematic Reviews and Meta-Analyses
Pvt	Private
SDG	Sustainable Development Goals
SE	Social Entrepreneurship
Shib	Shinganj

SI	Sustainable Income
SLR	Systematic Literature Review
SP	Sustainable Production
TMSS	Thengamara Mohila Sabuj Sangha
UNDP	United Nations Development Programme
USDA	United States Department of Agriculture
Vs	Versus
VS	Veterinary Service
WHO	World Health Organization
YC	Yunus Centre

## **CHAPTER ONE**

### **INTRODUCTION**

#### **1.1 Introduction and research aim**

Food security has been acknowledged as a fundamental necessity in global human rights since the early 1970s, with far-reaching implications beyond theoretical frameworks. This introduction delves into the multifaceted dimensions of food security, covering production, distribution, consumption, trade, malnutrition, hunger, and food insecurity (McCarthy et al., 2018; GHI, 2021). At its essence lies the assurance of people's access to adequate food sources, encapsulated by the four critical elements: availability, access, utilisation, and stability (FAO, 2018; Sen, 1981; Food and Agriculture Organization of the United Nations, 2006, 1996; Roy, Sarker Dev & Sheheli, 2019; USDA, 1996).

Recognising food security as a fundamental human right necessitates a broader perspective, going beyond theoretical constructs to examine its real-world consequences. The World Bank (2022) defines food security as continuous physical, social, and economic access to sufficient, safe, and nutritious food that aligns with individuals' preferences and dietary needs for an active and healthy life. This conceptualisation raises pivotal questions about the practical implications of considering food as a fundamental human right on a global scale and the tangible challenges faced by diverse communities. This exploration aims to uncover on-the-ground realities, viewing food not just as sustenance but as an inherent entitlement crucial for the well-being of individuals and societies.

While the World Bank's definition underscores the global importance of food security, this study delves explicitly into social entrepreneurship, focusing on agripreneurship in addressing these critical issues (World Bank, 2022). Social entrepreneurship, embodied by farm-based social entrepreneurs, is a pivotal force in the quest for food security. These individuals operate within a hybrid organisational model that combines social and economic objectives, delivering goods and services that benefit the community and enhance food security.

The link between social entrepreneurship and food security, particularly in the context of economic growth, has been acknowledged (Kabir et al., 2012; Rudolph et al., 2021). The 'how' of this linkage lies in social entrepreneurship, which inherently seeks innovative and



sustainable solutions to societal challenges. By blending social and economic goals, social entrepreneurs address the root causes of food insecurity, creating resilient and community-focused agricultural practices.

The 'why' is rooted in the transformative potential of social entrepreneurship. Unlike traditional approaches, social entrepreneurship goes beyond charity or aid, aiming for systemic change. In the context of food security, this means addressing immediate needs and fostering long-term solutions that empower communities and build self-sufficiency. Social entrepreneurship catalyses positive change by promoting inclusive and sustainable development, where local communities actively participate in and benefit from food production initiatives.

However, there needs to be more literature concerning farm-based social entrepreneurship and its specific impact on food security. This study aims to fill this void by exploring the challenges associated with sustainable food production, income generation, and farm-based social agripreneurship in Bangladesh.

Bangladesh, as a developing country, faces substantial food insecurity risks exacerbated by factors such as a high multidimensional poverty index, adverse weather events, and the impact of climate change on its ecosystem (GMPI, 2021; CRI, 2021). These challenges affect food production practices, household income, and livelihoods. The country's vulnerability to climate change is accentuated by its geographical location in the Delta zone, making it prone to flooding, cyclones, and other climate-related hazards (Country Profile, 2018; Ali, 2021).

Furthermore, the study highlights the corruption challenges in Bangladesh, as reflected in its low rank in the Corruption Perception Index (CPI) 2022 (CPI, 2022). The pervasive corruption, marked by a lack of transparency and bureaucratic inefficiencies, poses additional hurdles to effective food security programs and assistance delivery.

Considering these multifaceted challenges, this research aims to provide insights into Bangladesh's food security issues through the lens of social entrepreneurship. By doing so, it aspires to present an entrepreneurial ecosystem framework that identifies the challenges and offers potential solutions to enhance food security in the country.

## **1.2 Research gaps and questions**

Food security research is undeniably crucial, demanding substantial investment and attention due to its fundamental role in human well-being and sustainable development (FAO, 2019; FAO, IFAD, UNICEF, WFP, & WHO, 2018; IFPRI, 2016). In navigating the landscape of food security research, this study aims to pinpoint critical gaps that contribute to the broader discourse and elucidate the specific context of our investigation.

Firstly, the research illuminates the need for a deeper understanding of the root causes of food insecurity, emphasising the importance of practical solutions (Arshad, 2022; FAO, IFAD, UNICEF, WFP, & WHO, 2018; FAO, 2015; Pinstrup-Andersen, 2009). By delving into the challenges small-scale farmers face in developing countries, such as inadequate access to land, credit, and markets. The study seeks to provide insights that can inform policies and interventions, addressing underlying factors that perpetuate food insecurity.

Secondly, the research highlights the gap in knowledge regarding innovative technologies and practices that can enhance food production and distribution, particularly in the face of environmental challenges (FAO, 2017; Godfray et al., 2010). By exploring avenues such as precision agriculture technologies and alternative farming approaches, the study aims to contribute to developing strategies that increase crop yields while minimising environmental impact.

Thirdly, a critical research gap lies in understanding how to promote sustainable, resilient, and inclusive food systems (Godfray, Garnett, & Tilman, 2018; HLPE, 2017; 2019). The study seeks to fill this gap by identifying policies, practices, and technologies necessary to achieve these goals. Thereby contributing to a comprehensive understanding of food security's social, economic, and environmental dimensions.

Moreover, the research identifies a scarcity of studies on the connection between social entrepreneurship and food security, particularly in developing countries like Bangladesh (Kabir & Huo, 2011; Ramachandran et al., 2022; Yunus, Moingeon, & Lehmann-Ortega, 2010). As social entrepreneurs aim to do social good, their potential impact on small-scale food security in developing countries presents a valuable yet underexplored avenue. This study aims to bridge this gap by investigating the role of social entrepreneurship in food

security and exploring how it can contribute to sustainable food production, income, and livelihoods.

In the realm of entrepreneurial ecosystems, the study recognises the need for further research to understand their impact on food security (Hosseinzadeh, Foroushani, & Sadraei, 2022; Lundh, 2022). Entrepreneurial ecosystems that support successful entrepreneurship may be vital in fostering sustainable food systems. This research seeks to contribute to this understanding, investigating the elements within entrepreneurial ecosystems that can support and enhance food security initiatives.

In light of these gaps in the literature, the primary research question for this study emerges: *How can social entrepreneurship promote sustainable food production and food security within a supportive entrepreneurial ecosystem of a developing country?*

The subsequent sub-questions are formulated to guide the investigation:

1. What is the current state of food security in Bangladesh?
2. What are the sustainable food production practices that lead to sustainable income for farm-based social entrepreneurs in Bangladesh?
3. What is the current role of social entrepreneurs within the agriculture ecosystem in Bangladesh?
4. What barriers do social entrepreneurs face concerning milk and beef production in Bangladesh?

### **1.3 Chapter summary**

Chapter One introduces the overarching theme of food security as a fundamental human right and outlines the research aim of exploring the intersection between social entrepreneurship, particularly agripreneurship, and food security. The chapter emphasizes the multifaceted dimensions of food security, covering production, distribution, consumption, trade, and malnutrition. The World Bank's definition of food security is discussed, framing it as continuous access to sufficient, safe, and nutritious food. The chapter asserts the transformative potential of social entrepreneurship in addressing the root causes of food insecurity and emphasizes the study's focus on farm-based social entrepreneurship in Bangladesh. The country's vulnerability to climate change and corruption challenges are highlighted as significant factors affecting food security. The research gaps and questions

section identify critical areas where literature is lacking, including understanding the root causes of food insecurity, innovative technologies for food production, and the connection between social entrepreneurship and food security. The primary research question and sub-questions are formulated to guide the investigation, focusing on the role of social entrepreneurship in promoting sustainable food production and addressing specific challenges in Bangladesh, such as those related to milk and beef production.

## **CHAPTER TWO**

### **LITERATURE REVIEW**

This chapter provides a comprehensive review of the literature concerning food security, social entrepreneurship, and the entrepreneurial ecosystem to identify gaps, inconsistencies, and contradictions. These identified issues form the foundation for the theoretical framework and research propositions. The literature underscores that food security encompasses availability, access, utilization, and stability (WHO, 2015), and the chapter delves into a detailed exploration of these elements to establish a solid research base.

The review was initiated with a systematic literature review (SLR) method examining the intersection of social entrepreneurship, food security, and entrepreneurial ecosystems. Conducted on Scopus and ScienceDirect databases, the SLR, employing relevant filters and keywords, yielded 287 articles. Various operators, including Boolean and proximity operators, were utilized to refine the database search based on user specifications. The SLR followed the PRISMA analysis method, involving four stages: identification, screening, eligibility, and inclusion of studies.

Due to the multidisciplinary nature and diverse perspectives of the three domains, conducting an SLR on these topics posed challenges. Furthermore, the limited existing research on the intersection of the three concepts complicated the identification of relevant studies covering all aspects. The varying quality of research and methods introduced potential impacts on the review's reliability and validity. While the SLR narrowed the search, it became evident that a more inclusive scoping review was necessary to ensure the incorporation of all relevant articles relating to the triad of topics.

A scoping review was employed to map and summarize the literature on a specific topic (Cobey et al., 2018; Dal Farra et al., 2022; Kastner et al., 2012). Unlike a systematic literature review, a scoping review does not typically assess study quality or synthesize findings; instead, it provides a broad overview of the research landscape.

Conducting a scoping review at the intersection of food security, social entrepreneurship, and entrepreneurial ecosystems offers several advantages. Firstly, it assists in identifying the breadth and depth of available literature, revealing knowledge gaps and areas requiring

further exploration. This information informs the development of future research agendas, directing efforts towards critical areas.

Secondly, a scoping review elucidates key themes and concepts across studies, offering insight into relationships between food security, social entrepreneurship, and entrepreneurial ecosystems. This understanding informs policy and practice by pinpointing areas where interventions are most effective. Thirdly, a scoping review uncovers potential overlaps and synergies, such as social entrepreneurship's role in addressing food insecurity through sustainable and equitable food systems. This provides insights into integrating these areas to achieve social and environmental goals while generating financial returns.

In conclusion, a scoping review on the intersection of food security, social entrepreneurship, and entrepreneurial ecosystems offers a valuable overview of available literature, identifies areas for future research and action, and promotes a holistic approach to addressing complex social and environmental challenges.

The methodology section details the systematic literature review process using the PRISMA framework in figure 2.1 below, providing a flow diagram illustrating information flow across various phases and categorizing records into identified, included, and excluded subsets. The section then delves into the different phases of the systematic review, starting with the identification phase. While not covered in as much detail, the scoping review also contributes valuable insights by mapping the available literature on the intersection of food security, social entrepreneurship, and entrepreneurial ecosystems.

The systematic review method, guided by the PRISMA framework, is detailed in the methodology section. This section outlines the flow of information through the systematic review phases, with a flow diagram categorizing records into identified, included, and excluded subsets. Integrating the PRISMA framework principles ensures transparency, rigour, and reproducibility throughout the literature review process.

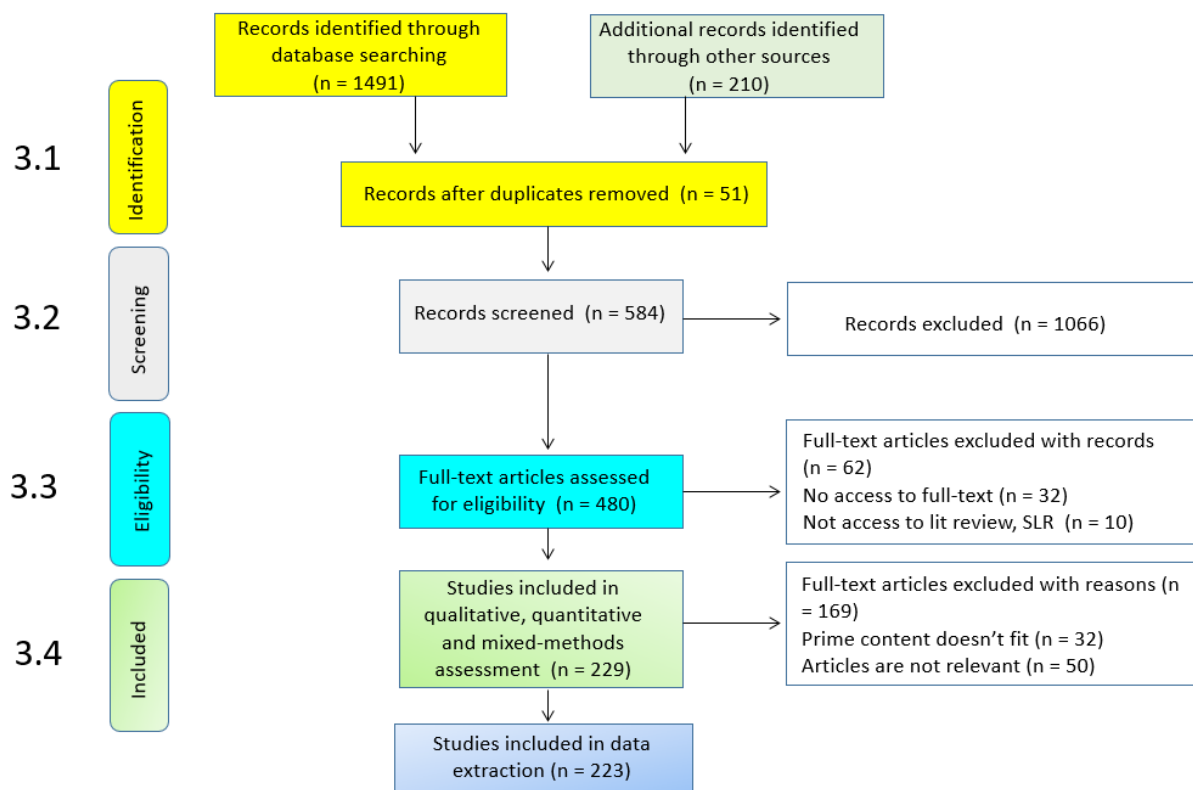
The methodology section emphasizes the identification phase, providing insight into the strategies and criteria for locating relevant literature. The systematic approach, including using different operators and specified filters, is designed to comprehensively capture articles

relevant to the intersection of social entrepreneurship, food security, and entrepreneurial ecosystems.

Subsequently, the detailed phases of the systematic review, including screening, eligibility assessment, and inclusion of studies, are explored in the methodology section. The adherence to the PRISMA framework guidelines in each phase reinforces the credibility of the systematic review, facilitating a robust evaluation of the research methodology.

The methodology section highlights integrating the PRISMA framework's principles throughout the systematic literature review. These principles, encompassing a structured approach to literature search, explicit inclusion and exclusion criteria, and a systematic process for screening and selecting studies, contribute to the overall reliability and validity of the comprehensive review.

#### PRISMA framework



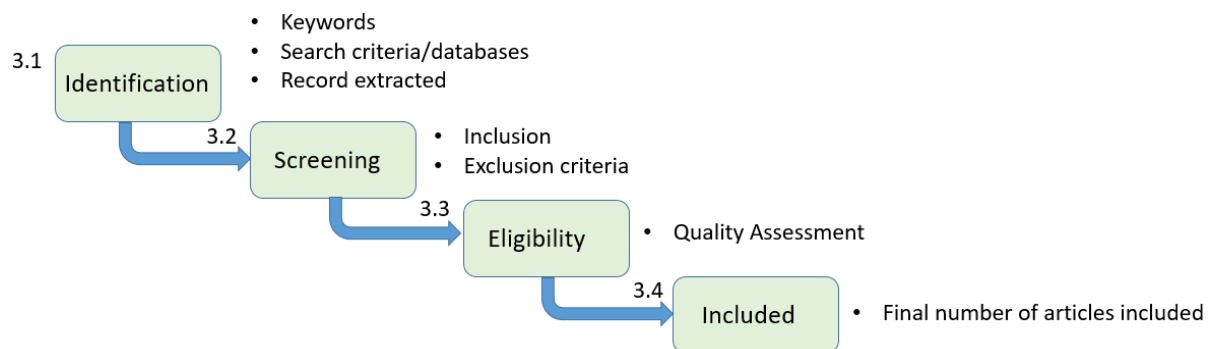
**Figure 2.1 PRISMA framework**

*Moher et al., 2009*

In summary, the seamless integration of the PRISMA framework and including a scoping review in the methodology section ensure a transparent, rigorous, reproducible literature review process. This approach enhances the credibility of the research and provides a clear understanding of how studies on food security, social entrepreneurship, and entrepreneurial ecosystems were identified, screened, and included in the literature review.

As presented in Figure 2.2, the PRISMA framework outlines a systematic four-step approach: identification, screening, eligibility, and determining the final number of included articles. The detailed methodology, focused on the identification phase, covers keywords, search criteria, and records extracted.

### *PRISMA framework*



**Figure 2.2 PRISMA framework (Reporting)**

### *Identification*

#### Keywords

- Single word
- Ecosystem
- Combination of words
- "Social Entrepreneurship"
- "Food Security"
- "Entrepreneurial Ecosystem"
- Boolean Operator
  - "Social Entrepreneurship" AND Food Security
  - "Social Entrepreneurship" OR Ecosystem
  - SAME, NEAR
  - NOT in SAME



Scopus includes document search, export to excel, and record extracted.

- Document search
- Export (CSV/ Excel)
- Record extracted.

#### *Identification phase*

This phase outlines the keywords, search strategy, and search criteria employed. It emphasizes the importance of a straightforward research question and details using Boolean operators, proximity operators, and specific database searches to refine results. The total number of searches and final articles are presented, highlighting the precision achieved through a comprehensive search approach.

#### *Selection criteria*

The selection criteria adhere to the PRISMA framework and focus on mapping literature in food security, social entrepreneurship, and entrepreneurial ecosystems. The search scope is narrowed based on subject areas, publication year, and global focus. A total of 223 records are extracted at this stage.

#### *Screening and eligibility phases*

The screening phase identifies and excludes articles, leading to the final count of 584 articles. The eligibility phase involves quality assessment, ensuring original research articles and review papers are included. After a thorough evaluation, it details the exclusion criteria and the final count of 480 articles.

#### *Descriptive analysis*

The final phase includes a descriptive analysis, presenting the number of articles per concept and providing insights into the distribution of articles across journals, concepts, and years of publication.

**Table 2.1      Distribution of articles by concept**

Serial No	Name of Journal	Number of articles
1	Food Security	105
2	Social Entrepreneurship	148
3	Entrepreneurial Ecosystem	34
Total		287

Table 2.1 presents the articles categorized by the three main concepts: Food Security, Social Entrepreneurship, and Entrepreneurial Ecosystem.

## **2.1      Food security**

### *2.1.1    Introduction*

The world is facing a significant problem of food insecurity, which has been an important issue since the world food crisis in the early 1970s (Global Citizen, 2020). The concept of food security was initially introduced at the 1st World Food Conference Summit in 1974, which emphasized the importance of an adequate supply of basic food and its availability to sustain a continuous supply of food for consumption purposes (Reutlinger & Others, 1986). Maxwell (1996) extends the definition by proposing that food security is achieved when "all people at all times have access to enough food for an active and healthy life" (World Bank, 2022). The most cited definition of food security since 1986 has been the World Bank policy study definition, supported by Maxwell and Wiebe (1998), that suggest secure access to food is crucial for achieving food security in marginal areas, poor, helpless people, women, and children.

The concept of food security was officially defined in 1996 at the 2nd World Food Summit, where it was described as the state in which all individuals have constant access, both physically and economically, to an adequate supply of safe and nutritious food that meets their dietary requirements and preferences, enabling them to lead healthy and active lives (Skoet & Stamoulis, 2006). This definition was subsequently embraced by the Food and Agriculture Organization of the United Nations (FAO, 1996) and the World Bank. According to this definition, food security is considered to be present when all individuals have consistent access to an adequate quantity of suitable food through domestic production or importation, ensuring that the majority of the population is sufficiently nourished (Matemilola, 2017).

Pinstrup-Andersen (2009) argues that availability and adequate essential food supply do not cover nutritious food and dietary needs for an active and healthy life, which has been a new point of food security since the 1980s. The United States Department of Agriculture (USDA) (2013) agrees with Pinstrup-Andersen's (2009) model of food security (i.e., the medical model) and defines that all members at all times have access to enough food for an active and healthy life. Researchers use different definitions of food security, but the common theme is the importance of adequate access to sufficient, safe, and nutritious food (Matemilola, 2017).

Food security is a severe threat to Bangladesh (Khanom, 2016; Pinstrup-Andersen, 2009), where inadequate food supply puts poor and middle-class people at higher risk (Muniruzzaman, 2013). Bangladesh currently has a population of 164.68 million, and the population density is 1,265 people per square kilometer ranking 88th in the list of countries by population (BBS, 2018). Since the famine of 1971 following liberation, Bangladesh has been grappling with food security issues (Mottaleb, Hossain, & Hossain, 2020). Despite this, there are very few studies that investigate the challenges of sustainable food production, food security, sustainable income, and farm-based social entrepreneurship in Bangladesh. This study recognizes that farm-based social entrepreneurs are potential drivers of sustainable food production and income, and hence can enhance food security.

### *2.1.2 Elements of food security*

At the International Conference on Nutrition in 1992, the World Health Organization announced that food security comprises four elements, namely: **availability, access, utilization, and stability** (WHO, 2015), which were endorsed by the World Food Conference in 1996, the Food and Agriculture Organization (FAO) and the United States Department of Agriculture (USDA) (FAO, 1996; USDA, 1996). Availability refers to domestic production or importation of sufficient quantities of appropriate food available for consumption or access by households or individuals with adequate income or other resources to access enough food for a healthy diet (USDA, 1996). Utilization refers to the quality of dietary intake and the capacity to absorb and use a good diet, including clean water, sanitation, and healthcare. The Food and Agriculture Organization (FAO) (2006) added another element of food security: stability that is achieved when people meet availability, physical access, economic access, and food utilization. The additional point of the author's illustration confirms social and economic access to food (Tisdell, Alauddin, Sarker, & Kabir, 2019). The FAO also confirms that dietary intake depends on individuals' ability to absorb nutrients in the body through the

food chain, which is impacted by clean water, sanitation, and healthcare (FAO, 2022; WHO, 2018).

### 2.1.3 Challenges of food security

Food security is a complex issue influenced by various factors, including natural hazards, climate change, infrastructure development, and sustainable food production (Maxwell & Wiebe, 1998). These factors significantly affect food availability, access, and utilization, necessitating a comprehensive approach involving multiple stakeholders (FAO, 2008; 2006).

#### *COVID-19's Ripple Effect: Navigating challenges in food security, agriculture, and global supply chains.*

Alabi and Ngwenyama's (2023) study highlights the profound impact of COVID-19 on food security and the Global Food Supply Chain (GFSC) in Canada and the US, advocating for a resilient post-pandemic framework in the food sector. In South Asian countries, Chandio et al. (2023) emphasize the need for dynamic climate policies, pointing to the substantial crop production boost resulting from financial development initiatives. Azadi et al. (2023) underscore the pivotal role of small-scale farmers in ensuring food stability and their positive contribution to natural capital, signalling the potential for a hunger-free world through sustainable agriculture. Additionally, Lasdun et al. (2023) reveal the exacerbation of supply-side issues by COVID-19, emphasizing the importance of targeted policy interventions, including social safety nets and alternative communication strategies for communities lacking phone access based on wealth levels.

Table 2.2 summarises food security studies conducted between 1986 and 2023, revealing its multidimensional nature akin to poverty. The table shows various methodologies such as qualitative (16), quantitative (18), and mixed methods (11); these studies emphasize the complexity of the problem with no one-size-fits-all solution. Notable findings include the importance of diverse production systems and infrastructure in effectively addressing food security concerns (Sunderland, 2011). Research focusing on both present and future generations is deemed crucial. Furthermore, these studies acknowledge the substantial impact of climate change on food security (Amir and Ahmed, 2013; Anik, Kabir, & Ray, 2012). Some studies also highlight the link between lower income and food security issues due to households struggling to access sufficient nutrition (BBS, 2018; Slater et al., 2009).

**Table 2. 2      Summary of selected studies on food security**

Author(s)	Method/Context	Key Findings	Future Research Direction
Alabi, M. O., & Ngwenyama, O. (2023)	Qualitative, North America	The study reveals COVID-19's profound impact on food security and the Global Food Supply Chain (GFSC) in Canada and the US, proposing a resilient post-pandemic framework for the food sector.	The study paves the way for future research on North American food security, highlighting the importance of detailed frameworks and crisis management analysis amidst COVID-19 and the Global Food Supply Chain (GFSC).
Chandio et al. (2003)	Quantitative, South Asia	South Asian countries need dynamic climate policies; financial development significantly boosts crop production.	Assessing modern technology's impact on food productivity and the environment.
Azadi et al. (2023)	Mixed-method, 28 countries	Small-scale farmers are crucial for food stability; a positive role in natural capital signals the potential for a hunger-free world with sustainable agriculture.	Elevate income for small farmers, identify key drivers, and explore effective methods to enhance African agricultural productivity for increased food availability.
Lasdun et al. (2023)	Quantitative, Tanzania	COVID-19 worsened supply-side issues, impacting households based on wealth levels; policy implications include social safety nets and alternative communication for phone-lacking communities.	To delve into specific causal links between the COVID-19 pandemic and food security in rural communities, addressing variations in perceived impacts across different asset levels for targeted policy design.
The World Bank (2022)	Qualitative, Global context	Food security, according to the 1996 World Food Summit definition, entails individuals having continuous access to adequate, safe, and nutritious food that fulfils their dietary needs and preferences, allowing for an active and healthy lifestyle. This definition of food security encompasses both the physical and economic dimensions of food access, ensuring that people can obtain the nourishment they require to flourish.	To devise strategies for holistic food security, addressing both physical and economic dimensions to ensure sustained access to nutritious food.
Rahaman, M. A., Rashid, M. A., & Saba, Z. (2022)	Qualitative, Sri Lanka.	Governments have a higher level of interaction and influence on disaster management in Sri Lanka, while external organizations contribute more at the bottom level. Networking and coordination are essential for effective emergency response, with credit going to external organizations.	To delve into sustaining initiatives like SHOUHARDO III through long-term community engagement, women's empowerment, and integration with government services.
FAO (2021)	Quantitative, 120 countries	The impact of COVID-19 had nutritional outcomes, which is still unfolding. The tariff can change the shape of domestic availability and consumption of foods with different nutritional values.	Explore integrated food system solutions to address significant drivers of food insecurity, malnutrition, and inequalities, emphasizing transformative policies and investments.

		Agricultural subsidies support the production of healthy foods and horticulture-related products.	
Global Hunger Index (2021)	Mixed method (A report of the global hunger index), Global context	The global hunger index 2021 measures the average value of a complicated set of quantities, such as Bangladesh's 19.1 score.	Focus on transformative policies and sustainable practices to address global hunger, malnutrition, and food insecurity.
Garcia, S. N., Osburn, B. I., & Jay-Russell, M. T. (2020)	Qualitative, Global context	Scientific research informs the regulation and practice of technological applications to increase food production and improve sustainable practices.	Prioritize the One Health approach, stakeholder engagement, and sustainable practices for global food safety and security while ensuring economic well-being for farmers.
AgriLink (2020)	Qualitative, Kenya	Food safety needs to be addressed in developing countries due to poor infrastructure and management. Small-scale farmers and women need access to the formal market to improve health and traditional livelihoods and increase food and nutrition security.	Focus on developing sustainable food safety interventions, exploring technologies, vaccinations, and governance restructuring while fostering inclusiveness in informal and formal markets.
Global Citizen (2020)	Qualitative, developing countries	Supply disruptions cause less food production, leading to higher prices. Food prices increased globally, leading to decreased availability and affordability.	Address global hunger by coordinating food aid, promoting peace, mitigating climate change, and stabilizing economies to tackle challenges in conflict, climate, and economic downturns.
Mottaleb, K. A., Hossain, A., & Hossain, M. I. (2020)	Quantitative, Bangladesh.	Policy implications link smallholder farmers to the market value chain, improving their livelihoods. Adaptation of food safety can increase the efficiency of dairy farmers by allowing them to use contract farming for high-value crops rather than non-contract farms.	Focus on developing and disseminating crop blast-resistant varieties, enhancing disease management, and scaling climate information services in South Asia for improved food security.
Free et al. (2019)	Quantitative, Global Context	Fisheries have nonlinear effects due to interactions between multiple processes. Ocean temperature affects productivity and population vulnerability to warming.	Explore the combined impacts of ocean warming and overfishing on marine fisheries, emphasizing resilient management for sustainable catches amid temperature-driven changes.
BBS (2019)	Mixed method, (The government report), Bangladesh	The report shows that 50% of people live in poverty, according to an economic census in 2019. The census shows that 40% of people out of 164.68 million live on less than US\$1 a day and are under food insecurity.	Enhance census data for future socio-economic surveys and economic research.
Plagányi, É. (2019)	Qualitative, Australia	Overfishing can lead to a decrease in fish populations. Risk-based management can influence sustainable fisheries and food security through sustainable management strategies, development, and adoption.	Explore strategies for sustaining fisheries in the face of climate change impacts on marine productivity.

World Health Organization (2018)	Mixed-method, seven case study countries	Leadership in sanitation and wastewater management needs to be improved in the health sector. Sanitation interventions are not achieving expected health outcomes.	Explore future research on integrating WASH (Water, Sanitation, and Hygiene) in emergencies, considering complex crises' evolving challenges and long-term health impacts.
Raihan et al. (2018)	Quantitative, Bangladesh.	Households in northern Bangladesh face food insecurity during the lean period due to the post-Aus harvest. Households with food security can become eligible beneficiaries through safety net programs and household subscriptions.	Explore impacts of climatic shocks and price hikes on post-aus household food insecurity, considering context-specific interventions for vulnerable regions.
BBS (2018)	Mixed method (The government report), Bangladesh	The root cause of malnutrition is insufficient income, financial instability, and less production, which triggers food insecurity. The government report confirms that 60% of households have food security and vitamin deficiencies.	Provisional statistics offer insights into current social and economic trends, with some figures subject to revision, guiding future research goals.
Matemilola, S. (2017)	Quantitative, Nigeria	Different segments of society have contributed to developing the agriculture policy framework. The agricultural policy was evaluated from colonial to contemporary times. Small-scale farmers are essential for food production in Nigeria.	Revitalize Nigeria's food security by addressing production challenges, gender inequality, policy inefficiencies, corruption, conflicts, climate change, and technology gaps. Emphasis on government initiatives for employment, credit facilities, infrastructure, and environmental monitoring is crucial.
Porter et al. (2017)	Quantitative, Global context	Indigenous knowledge is essential for food security in many areas. Adaptation is essential for food security.	Explore future research directions to enhance global food security by developing climate-resilient food systems, focusing on evaluating and optimizing adaptations across various food system levels.
Khanom, T. (2016)	Mixed-method, Bangladesh	Salinity encroachment increases labour, fertilizer, and pesticide costs. Farm expenses are higher than production, leading to a lack of balance between income and production, threatening agriculture.	Address soil salinity in Bangladesh's interior, emphasizing awareness of fertilizer use, introducing salt-tolerant crops, and exploring alternative farming. Social forestation, homestead gardening, and pond fishing can contribute to food security amid changing market dynamics.
BBS (2016)	Mixed method (The housing census), Bangladesh	The household census shows that rural people have less savings and more investment than urban people. Urban people have more household expenses on basic needs and durable goods than rural people.	Enhance life table methodology, address data gaps, and improve migration stats for better demographic insights.
Asaduzzaman et al. (2016)	Mixed method, Bangladesh.	The skill development program can be used for climate-smart technologies through a workshop or knowledge sharing. To create a district-wise database, run dynamic crop models favouring socio-economic	Focus on developing and evaluating Climate Smart Technologies, generating data on climate change impacts, and building skills for optimization experiments to enhance agricultural adaptation in Bangladesh.

		development and trade-off models. Farmers apply local knowledge for their crops that adapt to climate change.	
WHO (2015)	Mixed-method, Global context	Food insecurity and nutritional outcomes are linked due to differences in income between urban and rural areas. Global platforms, policies, and processes ensure coherence between food, agriculture, health, and the environment.	Fill the knowledge gap regarding the impact of climate variability and extremes on the production of these foods.
Islam et al. (2015)	Quantitative, Bangladesh.	Farm size and access to credit are vital factors in farm success. Integrated agriculture can improve food and nutrition security and poverty elimination.	Fill in the knowledge gap regarding the impact of climate variability and explore factors influencing the adoption of integrated rice–fish farming systems (IRFFS). Assess broader impacts on welfare, food security, and nutrition, emphasizing the need for both quantitative and qualitative data.
Ghose, B., Razib, B., & Sharmistha, G. (2014)	Qualitative, Bangladesh	Investments are needed to increase food production in coastal areas. Planning, supply, and demand of food are essential for success.	Address local measures for sustainable food security in Bangladesh, considering challenges such as urban expansion, climate change, and the need for more efficient agricultural practices in the face of growing population and urbanization.
Margulis, M. E. (2013)	Qualitative, Global context	Food and nutrition security programs can support agricultural production, technology, and research to achieve food security. The findings show the importance of international food security, global governance, policy implications, and human rights.	Address global food security governance conflicts, specifically in trade liberalization, financial speculation, and integrating human rights into crisis responses.
Hossain, M. Z., Kazal, M. H., & Ahmed, J. U. (2013)	Quantitative, Bangladesh.	Migrant households are more financially stable than non-migrant households. Policymakers must manage migration flows to leverage opportunities in Bangladesh.	Examine the long-term impacts of rural-urban migration on food security in Bangladesh through comprehensive analysis.
Muniruzzaman, A. N. M. (2013)	Qualitative, Bangladesh	Economic growth contributes to food security and reduces food insecurity. Economic growth alone cannot ensure food security for the most vulnerable population.	Explore Euro-Asian collaboration for enhanced food security through technology transfer, joint research on breakthrough technologies, urban farming development, and regular knowledge-sharing forums.
USDA, U. (2013)	Quantitative, Global context	The findings show that the data were aggregated values or numbers to where possible to match the food descriptions in the USDA National Nutrient Database for Standard Reference (SR). The findings show that the data came from various sources within the United States and other	Refine flavonoid data by studying individual glycosides, assessing varied analytical methods, and investigating flavonoid bioavailability in diverse food forms and preparations.



		countries; many foods are not included in the SR database.	
Amir, K. I., & Ahmed, T. (2013)	Quantitative, Bangladesh	Natural hazards increased due to climate change, which impacts agriculture and food security in Bangladesh. To identify the affected areas that require new planning to ensure food security	Focus on developing pragmatic adaptation strategies to mitigate the impact of climate change on food security, considering environmental, socio-economic, and governmental aspects.
Brahmana and et al. (2013)	Qualitative, India	Climate change is impacting food security in India, leading to challenges in crop production and food security. The regulatory body should focus on water management, agricultural pricing, and crop insurance to ensure food security.	Explore the potential impact of urban encroachments, specifically Special Economic Zones (SEZs), on food security in India, considering the trade-offs between economic growth and agricultural sustainability.
Anik, S. I., Kabir, M. H., & Ray, S. (2012)	Qualitative, Bangladesh.	To improve a new variety, which can improve crop yield and ensure food security. Climate change adaptation strategies are required in the affected areas, where they can increase crop yield and enhance food security.	Explore innovative agricultural technologies and adaptation measures to enhance food security in the face of climate change, focusing on sustainable practices and community engagement.
Sunderland, T. C. (2011)	Qualitative, Indonesia	There is a way to achieve nutritional and livelihood benefits by achieving food security through diverse production systems.	Integrate biodiversity science and agricultural research through a systems approach to advance sustainable agricultural systems, aligning with the 'agro ecological' vision for global food security.
Slater et al. (2009)	Quantitative, Canada	The finding shows that food security relates to lower income, which has ripple impacts on health outcomes. Low consumption of fruits and vegetables is not associated with higher BMI.	This study is needed to understand the evolving obesogenic environment in Canada, requiring comprehensive surveillance of diet, physical activity, and population weight using measured height and weight.
Pinstrup-Andersen, P. (2009)	Qualitative, Global context	The household's well-being is improved by implementing policies to improve child nutrition. Food access and food security are linked.	Refine the understanding of food security, addressing its limitations as an indicator of individual health and nutrition, and explore the interaction between household food security, behavior, and non-food factors for improved policy and program design.
FAO (2008)	Mixed method, Developing countries	Home gardening and livestock breeding can improve nutritional status. Clean drinking water, sanitation and health care, appropriate child feeding, and dietary selections can improve nutritional status.	Assess the effectiveness of FAO's strategy in integrating climate change adaptation measures into food security programs, emphasizing community engagement and local impact.
Skoet, J., & Stamoulis, K. G. (2006)	Quantitative, Global context	Development organizations are responsible for ensuring food security to fight hunger and poverty. Governments should commit to fighting hunger within and outside of their borders.	Assess strategies beyond the 2015 World Food Summit target, considering the impact of heightened global awareness and commitment to eradicating hunger.

FAO (2006)	Quantitative, FAO Report	Develop and implement effective policy frameworks to address climate change, water pollution, air pollution, water shortage, and biodiversity. Civil society needs to focus on environmental risks to reduce livestock and environmental impacts at a reasonable cost.	Focus on developing effective strategies and policy frameworks to mitigate the environmental impacts of the livestock sector, addressing institutional and political obstacles, and promoting a sense of urgency for change.
Maxwell, D., & Wiebe, K. D. (1998)	Qualitative, Global context	Multiple access to houses provides food security with less vulnerability than single access. The production process indicates short-term sustainability, considered short-term food insecurity with long-term capacity.	Explore innovative qualitative methods for investigating food security, considering intra-household distribution and dynamic indicators of vulnerability to enhance our understanding of this complex concept.
Food and Agriculture Organization. (1996)	Mixed method (The report of world food summit)	People need more food and meet their basic nutritional demands for vibrant health in developing countries. It is recognized that human resource development, research and infrastructure can achieve food security for present and future generations.	Investigate the effectiveness of international efforts and collaborations in achieving the commitments outlined in the Rome Declaration on World Food Security, focusing on addressing persistent global hunger and food insecurity.
Maxwell, S. (1996)	Qualitative, Global context	The finding shows that the main idea of diversity, complexity, and flexibility, which is the core point for the current policy on food security.	Investigate the practical implications of adopting a post-modern perspective in food security policy, emphasizing diversity, prioritizing livelihoods, and integrating ideas from various fields to enhance intervention effectiveness in diverse contexts.
USDA (1996)	Quantitative, Global context	The findings show that zinc deficiency needs to be improved. Systematic action is essential where food security, health, and child and maternal care are necessary to reduce malnutrition.	Assess the evolving effectiveness and impact of the U.S. Public Law 480 program in addressing global food security, considering changing agricultural policies and the growing mismatch between food aid resources and needs.
Allen, G. (1987)	Quantitative, Global context	The international community can help developing countries improve food security through assistance, policy reform, and investment to reduce poverty.	Investigate the effectiveness of targeted interventions in stabilizing food prices for vulnerable populations and assess the impact of global trade liberalization on food security.
Reutlinger, S. & Others, A. (1986)	Quantitative, Global context	The findings suggest that there is no single solution to the food security problem, similar to multidimensional poverty.	Assess cost-effective policy options, including international institutions like the World Bank, to address food security problems in developing countries.

Evidence indicates a reciprocal relationship between income and food production, with production costs playing a crucial role, especially for small-scale farmers (Agrilink, 2020; Matemilola, 2017; Mottaleb et al., 2020). Table 2.2 highlights that a significant challenge to food security is the insufficient policy frameworks and commitment from governments and

development organizations to support farmers (Matemilola, 2017; Margulis, 2013; Rahaman, Rashid, & Saba, 2022; Skoet & Stamoulis, 2006). As noted by Rahaman et al. (2022), governments can access external resources and influence policy development.

Margulis (2013) elaborated on the interrelation of food insufficiency in developing countries with various nutritional factors, including over-nutrition, malnutrition, and undernutrition. This issue extends beyond borders, impacting families in developed countries like the United States, where low dietary intake remains a primary cause of food insufficiency (USDA, 2013). The global economic crisis 2008, highlighted by Sunderland (2011), triggered a food crisis that significantly affected middle-income households. A study by Slater et al. (2009) using the Canadian National Population Health Survey revealed that 35% of low-income households faced food crises in 1998/99, while 14% of middle-income households experienced monthly food crises.

A report from the World Health Organization (Agrilink, 2020) emphasized that 600 million people in developing countries suffered from foodborne diseases in 2015, resulting in 420,000 deaths annually, including 125,000 children under five years old. The report stressed the integration of food safety, health, nutrition, trade, and development, underlining the importance of enhancing food safety for achieving food security. However, many developing countries require improved infrastructure development to control chemical, biological, or physical hazards that pose significant risks to the food supply chain (Agrilink, 2020; Food and Agriculture Organization, 1996).

In Bangladesh, agriculture extension services, as outlined by the Department of Agricultural Extension (DAE, 2016), play a pivotal role in supporting farmers. These services provide crucial information and offer training and resources to enhance agricultural practices, improve crop yields, and promote sustainable farming (DAE, 2023). Collaborative efforts between the government and various organizations, as reported by the Bangladesh Bureau of Statistics (BBS, 2023), involve the implementation of extension programs that disseminate modern farming techniques, pest management strategies, and market insights. Overall, these initiatives contribute to the comprehensive development of the agricultural sector, empowering Bangladeshi farmers with the knowledge and tools necessary for effective and resilient farming practices (DAE, 2023).

#### *2.1.4 Sustainable production*

Swisher (2006) defines sustainable production as a process and system of goods and services that are environmentally safe, economically viable, and healthy for workers, communities, and consumers, aiming to save natural energy resources. Similarly, Rosen & Kishawy (2012) define sustainable production as an approach that considers environmental, social, and economic factors, focusing on six elements of sustainable products: resources, workers, products, environment, society, and community.

Colin (2019) states that sustainability aims to balance social, economic, and environmental goals to benefit present and future generations. A sustainable diet comes from sustainable production that protects biodiversity and ecosystems, ensuring a continual supply of natural resources. Sustainable production can be culturally accepted, easily accessible, economically viable, safe, and healthy while enhancing human and natural resources.

Al Mamun, Nasrat, and Debi (2011) argue that integrated crop and livestock production systems can contribute to sustainable production. For example, crop residues can be used for livestock feed, and livestock waste can be used for biogas production that provides energy and fertilizer for fish farming, crop production, or livestock farming. On the other hand, Rahman, and Bulbul (2015) highlight that sustainability is an emerging concept, with most definitions incorporating three aspects: economy, society, and environment.

##### *2.1.4.1 Sources of sustainable food production*

Muniruzzaman (2013) observes that fair trade originated in the UK after World War II when Christian charities removed intermediaries to enable farmers to receive fair prices directly through their shops. Fairtrade has since expanded to include organic food production and promote good agricultural practices, thus contributing to sustainable production.

Colin (2019) identifies the advanced concept of sustainable intensification, which aims to increase food production on the same land while reducing environmental impact. In addition, Albajes et al. (2013) argue that crop diversification is essential for a sustainable environment, integrating crop physiology, crop biotechnology, and necessary knowledge and skills in plant breeding to create sources of sustainable food production.

Al Mamun et al. (2011) advocate for a mixed farming system that leads to an integrated, economically, and environmentally sustainable farming system and a source of sustainable food production. Integrated farming also creates employment opportunities for farmers, which is better than arable farming, and has a uniform distribution throughout the year.

#### *2.1.4.2 Challenges of sustainable food production*

Soil health is a critical element in food production. Underwood, McCullum-Gomez, Harmon, and Roberts (2011) conducted a study on the challenges of sustainable food production and identified unbalanced soil formation, nutrient cycle, and declining biodiversity globally as significant obstacles. Further, Bevier (2012) found that soil degradation, water scarcity, climate change, and energy problems affect sustainable food production. Alarmingly, the combined risks of crop failure due to crop disease and drought is a threat to sustainable crop production and farmers' income Ashby (2001). Additionally, UNEP (2009) reported that increasing soil degradation, cropland conversion into non-cropland for urbanization and industrialization, and changing climate are significant challenges for sustainable food production. Dwivedi et al. (2017) also emphasized the impact of changing climate on sustainable food production.

Ashby (2001) highlights the interrelated challenges in sustainable food production, such as climate change, soil formation, crop failure, soil erosion, and land conversion. Muniruzzaman (2013) demonstrates the importance of livestock and crop production systems in achieving sustainability dimensions, including society, economy, and environment, for sustainable food production and security. Finally, Albajes et al. (2013) suggest crop diversification and mixed farming as core issues for farm-based social entrepreneurs in addition to soil health, sustainable crop production cycle, and employment/income opportunities for food security. A fair-trade system is also crucial for sustainable food production, as it helps upstream and downstream of the production cycle (León-Bravo, Caniato, Caridi, & Johnsen, 2017). Maintaining agricultural productivity becomes impossible if the production cycle fails to provide for rural farmers. Hence, there are gaps in the food production cycle, such as upstream and downstream agricultural inputs for a farming business. Without productivity, the entire growth process of the farm business is under significant threat in Bangladesh (Planning and Unit, 2011). This study aims to explore sustainable food production sources, challenges, and income to achieve food security in Bangladesh.

### *2.1.5 Sustainable income*

Nordhaus (1995) defines sustainable income as the level of income that can be maintained in the future, generating enough savings to maintain a household's living standard. Similarly, Olokoyo et al., (2017) define sustainable income as the aggregate income of a household that adds value to the rural economy. Both studies agree that sustainable income refers to the income required by an individual, family, or household to meet their future needs. Thus, sustainable income is context-specific and depends on the situation. In Indonesia, there is a connection between predicting sustainable income, income distribution, and employment (Jasra et al., 2011). In addition, sustainable income is calculated by deducting the allowance for environmental depreciation from the gross domestic product (Mallick & Siddiqui, 2007). The above study confirms that sustainable income is a significant indicator of economic well-being, providing information about a country's natural resource usage. It also highlights the linkages between gross domestic product, income distribution, and employment.

#### *2.1.5.1 Income in relation to food security and household welfare*

Household consumption, a key welfare indicator, is generally influenced by gross Income, capital, assets, and labour (Carroll, 2001). Mishra et al. (2002) propose that individual Income is contingent on factors such as crop production, labour sales, or family wage earnings. Strengthening agriculture can boost food production and supply commodities for households (Ali, 2007), elevating farmers' Income and enhancing food security, thereby improving socio-economic, health, and living conditions. Deaton and Drèze (2009) emphasize the relationship between Income, food intake, and nutritional status, particularly for small households in India.

Gillespie and Kadiyala (2012) highlight the connection between sustainable income and health expenditure, a significant household welfare indicator. Emran et al. (2021) found a correlation between crop production and household income. Kumar (2019) affirms that daily food consumption, access to vitamins and minerals, children's education, and other expenses are household welfare indicators. Chegini et al. (2021) establishes that income is interconnected with food consumption and food insecurity, with higher food insecurity leading to lower food security. This study affirms the relationship between household income, food security, and welfare. However, household consumption dynamics change over time, contingent on income variations and the anticipated trajectory of income changes,

thereby influencing the level of consumption based on household wealth and stability (Carroll, 2001).

Collaborative efforts in forming sustainable agri-food systems, focusing on relationships, intermediaries, and critical elements such as certification, infrastructures, and education, are essential for sustainable market development (Matt, 2023). Simultaneously, the study introduces a framework proposing that buyer-initiated initiatives, including training, feedback, and financial assistance, contribute to sustainable farmer development, laying a foundation for future empirical validation (De Silva et al., 2023). Additionally, the study stresses the need for increased research and funding in Urban Agriculture (UA) to enhance urban resilience and food security. It advocates for comprehensive assessments of UA's impacts and calls for technological innovation for sustainability, highlighting the importance of transitioning toward a resource-conserving and environmentally friendly food system (Yan et al., 2022).

Table 2.3 summarizes studies conducted between 1995 and 2023 on sustainable production and income, covering regions like the USA, Bangladesh, India, and globally. Each entry includes the author, year, title, method/context, and key findings. The studies reveal that sustainable income can be achieved through modifying consumer and producer behavior, allocating income for resource depreciation, and improving energy efficiency in food production. Methodologies used include qualitative (15), quantitative (10), and mixed methods (4) to explore food security. Overall, integrated farming systems are essential for adapting to economic and environmental changes, while diversifying food production enhances nutrition. The private sector can contribute to public goods through strategic resource management. From this table, one can see that more research is needed on production, agronomic processes, and sustainable practices. It appears that organic agriculture shows higher productivity in deprived areas and challenging climates, but additional funding is required for long-term sustainability.

**Table 2. 3      Summary of selected studies on sustainable production and income**

Author(s)	Method/Context	Key Findings	Future research directions
Matt, M. (2023)	Qualitative, developing countries	The findings emphasize collaborative efforts in forming sustainable agri-food systems, focusing on relationships, intermediaries, and vital elements like certification, infrastructures, and education for sustainable market development.	Examine actors' roles, collective visions, state actions, and coordination challenges in sustainable market innovation.
De Silva, L., Jayamaha, N., & Garnevska, E. (2023)	Qualitative, developing countries	The study proposes a framework wherein buyer-initiated initiatives, encompassing training, feedback, and financial assistance, contribute to sustainable farmer development, laying the groundwork for future empirical validation.	The study introduces a framework for sustainable farmer development through buyer-initiated initiatives, emphasizing future research on buyer benefits, relationships, and diverse contexts.
Yan, D., Liu, L., Liu, X., & Zhang, M. (2022)	Mixed method, Global context	The study highlights the crucial need for increased research and funding in Urban Agriculture (UA) for urban resilience and food security. It underscores the importance of comprehensive assessments of UA's impacts and calls for technological innovation to ensure sustainability.	Divergent views exist on Urban Agriculture's (UA) impact on urban food security, with limited academic attention despite its recognized importance. The COVID-19 pandemic underscored the need for research on UA's resilience and sustainability, shaping future directions.
Kumar, B. (2021)	Quantitative, Bangladesh	International remittances and household welfare have a positive relationship. Households can make more money from off-farm activities than agriculture.	Exploring optimal policy measures to enhance remittance receipts and ensure the productive utilization of remittances to further elevate household welfare and reduce poverty.
Emran et al. (2021)	Quantitative, Bangladesh	Smallholders need the knowledge to participate in agriculture extension through improved technologies and management practices. Fertilizer application increases productivity per unit or household. Smallholders need off-farm income to reduce poverty.	Prioritize policies that support agricultural and off-farm income for smallholders to achieve food security and poverty goals. Emphasize sustainable measures, including increased cropping intensity and improvements in extension services, credit access, and infrastructure.
Chegini et al. (2021)	Quantitative, Iran	Income policies do not improve food security, as there is a small association between income and food security. The policy is essential for marginal and moderate households with food insecurity and inadequate income, as income is a key indicator of food security in rural areas.	Investigate causality in the household welfare and food security association, considering the cross-sectional design limitations and employing advanced statistical techniques.



Sage, C. (2019)	Qualitative, Nepal	Food sovereignty advocates favour a rights-based perspective on food, while others prefer a scientific approach. Sustainability and food security are increasingly intertwined.	Assess the efficacy and implementation of sustainable intensification and diets for environmental and health benefits, exploring policy measures and evaluating their impact on global food security.
Olokoyo et al. (2017)	Quantitative, Nigeria	The land deal directly opposes the other covariates on income sustainability. When land deals significantly affect sustainable income, other variables have different effects. Food sovereignty advocates favor a rights-based perspective on food, while others prefer a scientific approach. Sustainability and food security are increasingly intertwined.	Investigate alternative and sustainable income sources for those impacted by land deals, contributing to a comprehensive understanding of the economic consequences in African contexts.
León-Bravo et al. (2017)	Qualitative, Italy	Multi-level collaboration is needed to ensure product quality and safety.	Investigate the impact of variables like firm size on collaborative sustainability in different food supply chain stages and integrate theories for a holistic understanding while developing specific metrics for performance areas in each stage.
Dwivedi et al. (2017)	Qualitative, Global context	Resource-use-efficient crops are needed to reduce adverse weather effects on agriculture and enhance nutrition by combining them with integrated natural resource management. Dietary patterns in crop diversity can reduce environmental impact and improve health.	Prioritize innovative plant breeding, multi-stakeholder collaboration, and holistic approaches to identify environmentally friendly dietary patterns and improve public health.
Rahman, M. R., & Bulbul, S. H. (2015)	Mixed-method, Bangladesh.	Farmers' access to education improves their capacity to understand IRM and use AWD technology, leading to increased output. AWD adoption was influenced by farm size, household head education, interactions with extension workers, water scarcity, and demonstration-based dissemination.	To address the national relevance and applicability of Alternate Wetting and Drying (AWD) technology in irrigated rice production, the focus is on practical dissemination approaches and strategies for upscaling, particularly among farmers.
Niggli, U. (2015)	Qualitative, Global context	Organic agriculture has higher productivity in underprivileged locations and climates. Organic agriculture is effective and sustainable food production but requires more financing for R&D to address specific obstacles.	This research in organic agriculture should prioritize holistic strategies for sustainable farm productivity, emphasizing productivity gains that address the entire farm system while securing the positive ecological benefits offered by organic practices.
Albajes et al. (2013)	Quantitative, Global context	Research is needed to bridge production, process, and agronomic, and sustainable production practices.	Integrate diverse areas within the food production value chain, emphasizing genetic, molecular, environmental, and soil sciences to

		The private sector needs to improve storage, transport, and market links after farming and harvesting practices.	address global challenges in yields, quality, and resource constraints.
Rosen, M. A., & Kishawy, H. A. (2012)	Qualitative, Global context	Design and manufacturing sustainability can be improved by adopting a sustainability culture.	Promoting sustainable manufacturing through collaborative efforts and tools like design for the environment is crucial for future success despite potential challenges posed by economic priorities.
Gillespie, S., & Kadiyala, S. (2012)	Mixed-method, India	Malnutrition is caused by systemic factors that affect the entire population, and hunger is an example. Nutritional trends in agriculture indicators can be studied with a short-term dataset.	There is a crucial need for future research on links between recent agricultural changes and nutrition in India, requiring nationally representative datasets for effective policy interventions against undernutrition.
Bevier, G. (2012)	Qualitative, Global context	The gap between income and food security needs to be closed. Agriculture needs the plan to adapt to climate change and extreme weather events, and livestock production can help reduce poverty by providing a source of nutrition and income.	Addressing future research for global food systems requires attention to climate change, energy, resource management, health, population growth, policy, market access, integration, technology, and human capacity to enhance sustainability and combat food insecurity in a growing global population.
Underwood et al. (2011)	Qualitative, USA	Biodiversity is essential for sustainably grown foods, and further research is needed to understand the relationship between farming practices and soil quality. Dietitians should consider the environment and farming practices when recommending foods.	Explore organic agriculture's grassroots evolution, farmers' multidimensional goals, and integrated comparisons with conventional methods. Food professionals promote organic benefits, research impacts, and influence policies for ecological sustainability.
Planning, F., & Unit, M. (2011)	Mixed-method, Bangladesh	Diversification of food production is essential to improve nutritional status. Two programs are proposed to supplement the diet with micronutrients and animal proteins.	Assess the Bangladesh CIP's impact on sustainable food security, explore innovative interventions, and evaluate scalability for informed policy and program development.
Al Mamun, S., Nasrat, F., & Debi, M. R. (2011)	Qualitative, Bangladesh	An integrated farming system is needed to meet economic and environmental changes in Bangladesh. An integrated farming system should be implemented to diversify crop production in Bangladesh.	Optimizing mixed farming systems to enhance regular employment for farmers, increase agriculture-animal production efficiency, and address concerns related to pollution and the environment.
UNEP (2009)	Qualitative, Global context	Food stock speculation, extreme weather, low grain stockpiles, biofuels, and high oil costs contribute to the current food crisis. Improving food production's energy efficiency, recycling waste, and minimizing	Addressing the challenges of rising food prices, climate change, and population growth, the focus is optimizing food energy efficiency to enhance global food security.

		cropland use can help protect biodiversity, other natural resources, and human communities.	
Deaton, A., & Drèze, J. (2009)	Quantitative, India	The proportionate decline in nutrient intake among the bottom quartile of the per capita expenditure scale is significantly less than among the better-off. Per capita calorie consumption is lower in urban areas due to lower household expenditure.	Address the puzzling aspects of nutrition trends in India, focusing on recent changes and improving nutrition monitoring at the district level.
Mallick, S., & Siddiqui, R. (2007)	Quantitative, Indonesia	A sustainable income is calculated by subtracting environmental depreciation from the gross domestic product. It is possible to determine sustainable income by allocating a portion of income to accommodate the depreciation of natural resources.	Focus on evaluating the financial value of environmental problems in Indonesia, considering factors such as income distribution. Explore policy options for sustainable income, employment, and environmental management.
Ali, A. M. S. (2007)	Quantitative, Bangladesh	Population pressure and market incentives drive agricultural intensification and change the rural system. Agricultural inputs can improve the growth of agriculture and the rural system, reducing productivity and damaging the environment.	Explore sustainable farming practices, improved crops, and urban planning to enhance agricultural intensification and rural development in densely populated regions.
Swisher, S. (2006)	Qualitative, Global context	Changing producer and consumer behaviour is essential for sustainable production. Sustainable production should be integrated into decision-making processes.	To focus on a fundamental shift to strong sustainability in production, emphasizing the transition towards renewable resources for intergenerational fairness and a sustainable quality of life.
Mishra et al. (2002)	Qualitative, USA	Household well-being, farm income, wealth, and consumption are combined to create a comprehensive analysis. Adding wealth and spending can significantly improve farm households' well-being assessments.	To explore the impact of government policies on farm households, focusing on income diversity, off-farm employment, and the use of farm program payments to inform more enlightened policy options.
Carroll, C. D. (2001)	Quantitative, Global context	Saving and income growth are difficult to adapt to the modern consumption model.	Focusing on refining and expanding computational models of consumption behaviour to understand better the quantitative implications and conditions under which observed these models can capture consumer behaviour.
Ashby, J. A. (2001)	Qualitative, Global context	The private sector can only make public goods through strategic development and resource management.	Integrate food production and environmental health, adopt long-term strategies and adaptive management, involve diverse stakeholders, and foster learning

		The public sector can leverage natural resources and management to create a long-term strategic agenda for sustainable agricultural production.	communities for sustainable agriculture.
Nordhaus, W. D. (1995)	Quantitative, USA	Consumption was lower than sustainable income, leading to a decreased savings rate. The Fisherian and Hicksian hypotheses suggest that capital can be sustained indefinitely, including knowledge capital.	To refine measures of sustainable income and assess whether economies consume more or less than their sustainable incomes, considering concepts such as Fisherian and augmented Hicksian income.

## 2.2 Social entrepreneurship

### 2.2.1 Introduction

Social entrepreneurship, identified as a global phenomenon propelled by mission-driven businesses and innovative initiatives, addresses pressing societal challenges. Scholars such as Nicholls and Yunus have defined this transformative concept, emphasizing its prioritization of social goals over profit, and gaining recognition for its significant impact on poverty and unemployment (Nicholls, 2008; Yunus, 2009). However, a critical observation of the existing literature reveals a notable deficiency – a lack of a unified theoretical framework.

The concept of social entrepreneurship has been dissected and defined by various scholars, each providing unique perspectives on its nature and purpose. Nicholls (2008) characterizes social entrepreneurship as a global phenomenon involving mission-driven businesses, while Massetti (2008) argues for its role in creating and integrating economic activities through micro, small, and medium entrepreneurship/enterprise. Schaltegger and Wagner (2011) highlight the entrepreneurial role in uniting people, ideas, and capital to address societal problems.

Certo and Miller (2008) focus on the social goal inherent in social entrepreneurship, while Robinson (2006) suggests its dedication to addressing specific social problems. Light (2006) acknowledges the significant societal issues social entrepreneurship addresses and Korosec and Berman (2006) confirm their pivotal role in solving social problems. Hartigan (2006) proposes social transformation, and Tracey and Jarvis (2007) suggest that social entrepreneurship trades for a social purpose. Zahra et al. (2009) posit that social entrepreneurship enhances social wealth, and Yunus (2009) confirms its innovative initiative to aid people. Themes such as social entrepreneurs (Miller et al., 2012), society (Dacin et al.,

2011), social goals (Zahra et al., 2009), and social problems (Santos, 2012) collectively contribute to the holistic concept of social entrepreneurship.

Mair and Marti (2006) argue that social entrepreneurs act as agents of social change, similar to social movements. Other scholars (Perrini & Vurro, 2006; Seelos & Mair, 2005; Sharir & Lerner, 2006) agree that a social innovation mindset drives social entrepreneurship to create positive social impact. Diverging from traditional entrepreneurs, social entrepreneurs prioritize their social mission over profit maximization (Mair et al., 2012; Muñoz & Kibler, 2016). Globally acknowledged, social entrepreneurship addresses critical social problems such as food security, economic recession, unemployment, poverty, and illiteracy (Mswaka et al., 2016; Thorgren & Omoredede, 2018; Yunus et al., 2010).

A constantly evolving social phenomenon, social entrepreneurship has garnered increasing interest among practitioners and academics over the past thirty years (Mswaka & Aluko, 2015; Szegedi et al., 2016). However, the literature on social entrepreneurship remains fragmented and lacks a coherent theoretical framework (Weerawardena & Mort, 2006). Scholars have defined social entrepreneurship in various ways, as demonstrated in Table 2.4, reflecting diverse perspectives on the goals and activities of social entrepreneurship.

**Table 2.4      Selected definitions of social entrepreneurship (SE)**

S/N	Source	Year	Definition
1	Council	2015	SE (Social entrepreneurship) creates a significant contribution to post-disaster recovery works, and involves with skill development, education, healthcare, and new housing for marginal people in the Philippines.
2	Daru & Gaur	2013	Social entrepreneurs recognize unfulfilled needs and strive to address them.
3	Meldrim et al.	2012	In the United States, SE works as a community food security commission to achieve healthy and sustainable food safety and security.
4	Dacin et al.	2011	SE creates value for the society.
5	Hackett M.T.	2010	Literature of SE indicates the growth and incubation of SE in the USA, UK, European countries, Africa, Kenya, and Asian countries, including g different part of the world.
6	Nicholls; Certo & Miller	2008	SE defines in many ways.
7	Yunus	2007	Initial initiative helping others

8	Mair & Marti'	2006	SE innovates and combines resources to pursue opportunities to mobilize social change or social needs.
9	Seelos & Mair	2005	Social entrepreneurship changes society with a mission combining traditional entrepreneurship's inventiveness.

The literature on social entrepreneurship requires a coherent and well-defined theoretical framework (Short et al., 2010). However, the field is fragmented and lacks consensus on a unified definition (Dacin et al., 2011). This lack of construct legitimacy has led to undefined theoretical content and boundaries (Short, Moss, & Lumpkin, 2009).

Despite this, social entrepreneurship has become integral to many countries' mainstream economies. Some governments are accrediting it as a partner of state and non-profit sectors to address social challenges such as poverty, unemployment, and environmental issues (Tuli & Gupta, 2018). For example, in the UK, social entrepreneurship has significantly reduced unemployment rates in Yorkshire (Mswaka et al., 2016; Mswaka & Aluko, 2015).

Entrepreneurship, in general, has already been established as legitimate (Baker & Welter, 2015), and entrepreneurs organize the future by bringing together ideas, markets, factors of production, and relationships (Gartner & Teague, 2020). Social entrepreneurship encompasses various themes, including addressing societal problems, working towards a mission-driven objective, helping people, enhancing social wealth, and adding social value, as discussed above. Therefore, the activities of social entrepreneurship are highly relevant to this study.

### *2.2.2 The role of social entrepreneurship in enhancing food security.*

Social entrepreneurship is crucial in driving positive societal changes and addressing pressing issues such as food security and unemployment (Ali, 2007). Azmat (2013) provides an illustrative example, emphasizing the advantages of mixed cropping with livestock in recycling animal waste into crop fertilizer. This practice creates additional jobs for farmers and contributes to sustainable food production, ultimately enhancing food security.

Defined as the utilization of entrepreneurial principles to organize ventures that address social problems (Schaltegger & Wagner, 2008), social entrepreneurship is indispensable for fostering social change, economic development, and sustainability, especially within the realm of food production and security (Mohapatra, Khadanga, & Majhi, 2018).

Social entrepreneurs pursue diverse objectives, including agricultural development, economic transformation, and microfinance. Organizations such as the Ashoka Foundation, Aakruti Agriculture, The AMUL, Farm2Food Foundation, Star Agri, BRAC Agriculture, and the Grameen Foundation catalyse agricultural development and economic transformation (Mohapatra et al., 2018). Their efforts are crucial for ensuring food security in the agriculture sector. For instance, the Grameen Foundation disseminates knowledge that improves crop yields, reduces losses, and boosts the incomes of smallholder farmers in Asia, East Africa, West Africa, and Latin America, significantly contributing to food security (Grameen Foundation, 2020).

In response to pandemic challenges, Silva et al. (2023) reveal a notable shift towards social responsibility, driving individuals to become active social entrepreneurs in solidarity efforts. This transformation, influenced by high self-determination, holds the potential to impact long-term food security initiatives. Hussain, Ahmad, and Mia (2023) highlight a global emphasis on social enterprise performance, incorporating diverse theories and contributions from countries such as South Korea, Italy, and China. Adewunmi et al. (2023) stress the pivotal role of social enterprises in Community-based Facilities Management (CbFM), identifying five crucial dimensions for community development. The integration of social and environmental entrepreneurship, identified by Vedula et al. (2022), signals a transformative shift, with dimensions like service management and social inclusion holding implications for broader food security contexts. In Korea, Claassen, Bidet, and Kim (2023) challenge assumptions about public sector dominance within social enterprise networks, suggesting a potential re-evaluation of strategies to address regional food security challenges.

### *2.2.3 How farm-based SE relates to sustainable food production and food security.*

Tisdell et al. (2019) find farm-based social entrepreneurship is interrelated to sustainable food production, and food security. Additionally, Mohapatra et al. (2018) illustrate that social entrepreneurship brings about social change, increases food security, reduces unemployment, and solves the most pressing societal and community problems. An integrated agricultural system is associated with farm-agricultural diversity and enhances sustainable production, leading to food security (Tisdell et al., 2019). Crop diversification or mixed cropping with livestock enhances sustainability and on-farm agricultural production (Thornton, 2010; Abu Hatab, Cavinato, & Lagerkvist, 2019). For example, farm-based social entrepreneurs can operate integrated rice-fish farming, which reduces costs and environmental degradation. The

integrated rice-fish farm works as an economically and environmentally sound self-organizing sustainable production system (Xie et al., 2011). The integrated farming or mixed-cropping system allows farm-based social entrepreneurs to recycle animal waste, which turns into fertilizer, and use it in crops. In addition, crop residues are used as feed for livestock.

As argued elsewhere, social entrepreneurship can help in food security and is linked to farmer's markets. Social entrepreneurs take high risks, grow crops, and find market niches within the community (Quak, 2017) that contribute to food security. Social entrepreneurship incorporates entrepreneurial skills, knowledge, and principles into start-up ventures (Kahan, 2013). They use farmer's markets to sell their produce (Veidal & Flaten, 2011) and provide services to the community, addressing food security when they profit (Meldrim et al., 2012). For example, in farmer's markets in Philadelphia, entrepreneurs use a system that provides low-income holders of local community members' access to their products selling at a higher price in the farmers' market (Meldrim, 1912; Meldrim et al., 2012). Similarly, large-scale integrated agriculture is a holistic view of sustainable food production systems and ecological footprint run by social entrepreneurs in Singapore (Astee & Kishnani, 2010).

Social entrepreneurs deal with both livestock farming and crop production. Albajes et al. (2013) find that livestock production impacts crop production. They feed crop residue to livestock, and 40% of crops are used as animal feed. The process of livestock feeding creates environmental pollution due to manure, slurry, and methane gas. Farm-based entrepreneurs grow feed crops that destroy methane gas. They use animal waste as crop fertilizer, reducing costs and increasing production, increasing household income and food security (Albajes et al., 2013). Mixed cropping with livestock allows farm-based social entrepreneurs to recycle animal waste into crop fertilizer. The integrated farming system enhances sustainable food production, leading to food security.

Social entrepreneurs, sustainable food production, and food security are related to agriculture extension services, credit facilities, and natural hazards. Islam et al. (2015) illustrate that the farming system includes limited agriculture extension services, the need for more awareness of climate change, the knowledge gap among farmers, and limited fruitful training facilities. Financial barriers, limited credit access, and a need for more services from government agencies such as the SME foundation of social entrepreneurship exist. It is worth noting that in most developing countries like Bangladesh, there is no farming insurance. Islam, et al.



(2015) show that sustainable food production systems affect farmers therefore barriers to mixed cropping (i.e., agricultural input supply and market links) or integrated farming systems need to be explored further.

#### *2.2.4 Social entrepreneurship in milk and beef production in developing countries.*

Social entrepreneurship has emerged as a promising approach to promote sustainability and ethics in developing countries' sectors like milk and beef production (Amaghous & Hssain, 2021; UNDP, 2020). However, it is essential to acknowledge that large-scale industrial operations dominate this sector in many developing countries, leading to negative social and environmental impacts (FAO, 2021). Social entrepreneurs collaborate with local farmers to address these challenges in establishing cooperatives or collectives that prioritize small-scale, sustainable production methods, fair trade practices, and community engagement (Mair et al., 2012). This approach improves animal welfare, productivity, waste reduction, and market access, particularly in organic or grass-fed beef production (Pacheco, Dean, & Payne, 2010). Moreover, social entrepreneurs promote milk and beef consumption as part of a healthy diet while addressing food insecurity and malnutrition issues. Initiatives such as school feeding programs, nutrition education campaigns, and value-added product development, like yogurt or cheese, contribute to achieving these objectives (Dzingirai, 2021). In summary, social entrepreneurship offers a promising solution to create a more sustainable, equitable, and inclusive milk and beef production model in developing countries, benefiting producers and consumers (Mair & Marti, 2006).

The studies summarized in Table 2.5 provide insights into various aspects of social entrepreneurship, emphasizing the importance of innovative business models, transformative change, capital access, and opportunity identification. These studies employed qualitative (39), quantitative (8), and mixed methods (8) to explore food security. Additionally, the studies highlight the demand for social entrepreneurship in developing countries and the significance of considering political elements for a comprehensive understanding of the field.

**Table 2. 5      Summary of selected studies on social entrepreneurship**

Author(s)	Method/Context	Key Findings	Future research directions
Silva et al. (2023)	Qualitative, Portugal	Individuals demonstrating social responsibility during the pandemic, driven by high self-determination, transform into social entrepreneurs, co-creating value through solidarity and offering potential solutions for mitigating long-term effects.	Replicate the study using diverse methods, incorporating beneficiary perspectives quantitatively, and integrating Self-Determination Theory and Social Identity Theory to explore social identity development during crises.
Hussain, A., Ahmad, S. A., & Mia, M. S. (2023)	Mixed-method, Global context	The study uncovers a rising trend in global research on social enterprise performance, emphasizing diversity in theories and contributions from countries like South Korea, Italy, and China.	Explore case studies, alternative indicators, and contextual influences in social enterprise performance, testing diverse models and addressing language limitations to understand the field comprehensively.
Adewunmi et al. (2023)	Mixed method, Developing countries	The scoping review identified five dimensions of Community-based Facilities Management (CbFM) for community development, involving social enterprises in service management, social inclusion, and improving community infrastructure efficiency.	Empirically explore and validate the dimensions of Community-based Facilities Management (CbFM), including its application in diverse amenities and the role of technology in facilitating community participation.
Claassen, C. H., Bidet, E., & Kim (2023)	Quantitative, South Korea	The study reveals diverse social enterprise network behaviors in Korea, challenging assumptions of public sector dominance and suggesting a significant portion deviates from traditional social economy concepts.	Explore social enterprise interactions, address sample size limitations, examine market-oriented opportunistic behavior, and investigate the link between network activity and performance.
Vedula et al. (2022)	Mixed-method, Global context	The historical perspective reveals a vibrant surge in entrepreneurship and public good research. The integration of social entrepreneurship and environmental entrepreneurship signals a transformative shift, potentially eliminating the need for separate streams.	To address social, environmental, and economic challenges through entrepreneurship. Researchers should adopt outlined principles to expand and concentrate the field's impact on pressing global challenges.
FAO (2021)	Quantitative, Global context	Agriculture impacts the environment's quality and food security. The statistical data discusses the economic significance of agricultural activities, inputs, outputs, and factors of production. It also covers their effects on food security and nutrition and their impact on the environment.	Focus on strengthening agricultural statistical systems and exploring innovative approaches to ensure timely, accurate data availability in the face of global challenges like pandemics.
Amaghous, J., & Hssain, J. A. (2021)	Qualitative, Morocco	Social entrepreneurship is a powerful means for individuals to enhance their capabilities and create positive change. Social enterprises' difficulties and obstacles indicate a need for more effective support and assistance.	Assess scalability, sustainability, and the impact of government support, which is vital for fostering long-term success and a robust ecosystem.
Dzingirai, M. (2021)	Qualitative, Zimbabwe	The findings indicated that entrepreneurship significantly	Overcome limitations by using larger, diverse samples and conducting

		impacts poverty in agricultural communities by promoting food security, transferring skills, creating job opportunities, generating income, and reducing the cost of food.	longitudinal studies for broader insights and improved generalizability.
UNDP (2020)	Qualitative, Global context	Social entrepreneurship has the potential to bring a sustainable approach to tackling social issues that non-profit organizations may not offer.	Focus on enhancing support for young social entrepreneurs in Asia-Pacific during crises, addressing challenges highlighted in the Youth Solutions Report.
Grameen Foundation (2020)	Qualitative, Bangladesh	The findings show that a sudden increase in delinquency, high client drop-out rate, staff turnover, and lack of money, a leadership vacuum, and political meddling could lead to severe issues and endanger the institution's existence.	Focus on enhancing support for young social entrepreneurs in Asia-Pacific during crises, addressing challenges highlighted in the Youth Solutions Report.
Gartner, W. B., & Teague, B. T. (2020)	Qualitative, Global context	Behavior, practice, and process are essential to successful entrepreneurship. Entrepreneurs must become researchers to understand the entrepreneurship process.	Prioritize diverse perspectives, multi-method approaches, and fieldwork to understand "entrepreneurial doing," emphasizing actions (behavior/practice/process) over identity.
Tisdell et al. (2019)	Quantitative, Bangladesh	New technologies are less able to sustain growth in Bangladesh. Income levels are threatened, given that rice yields' ecological and environmental sustainability is in doubt. Crop diversification can reduce farm-level risk and promote social and economic sustainability.	Explore farm-level factors influencing agricultural diversity in regions like Bangladesh, where heavy reliance on rice poses threats and investigating the impact of crop diversification is crucial for sustainability and reducing risks for small farmers.
Tuli, S., & Gupta, A. (2018)	Qualitative, Hong Kong	Non-profit organizations contribute to economic growth through entrepreneurship and human capital.	Focus on theoretical challenges, sector characteristics, and the indirect positive effects of non-profits on economic growth through entrepreneurship and human capital.
Mohapatra, S., Khadanga, G. S., & Majhi, S. (2018)	Qualitative, India	Social entrepreneurship is essential for economic growth, transformation, empowerment, food security, sustainability, and leadership development. Social entrepreneurship is a tool for inclusive growth.	Explore the contextual factors influencing social entrepreneurship development in India's agricultural sector, considering its diverse social, economic, psychological, environmental, and cultural dimensions.
Thorgren, S., & Omorede, A. (2018)	Qualitative, Nigeria	Leaders use four strategies to embed the social mission among the target population: empowerment, awareness-raising, personal help, and role modelling.	Address limitations by exploring various forms of social enterprise and extending the investigation to different African regions, using longitudinal studies to understand leader passion's impact over time.
Quak, E. (2017)	Qualitative, Global context	Coaching from support organizations is essential for creating communication networks and self-organization. Social entrepreneurs need to know and understand the opportunities in their ecosystems, regardless of laws, regulations, or partnerships.	Investigate government recognition of social enterprises, the efficacy of public-private partnerships, and international collaborations in supporting food security-focused social entrepreneurs.

Mswaka et al. (2016)	Mixed-method, UK	Social enterprises need institutional and technical support to achieve welfare goals and create jobs.	Explore the evolution of social enterprise business strategies, the impact of reduced institutional funding, and government policy influence. Comparative studies across diverse UK social contexts can provide additional insights.
Muñoz, P., and Kibler, E. (2016)	Quantitative, UK	Local authorities are dominant, but there are complementary conditions. It is necessary to establish local institutions that promote social entrepreneurship.	Explore how diverse local institutional factors, beyond local authorities, collectively shape opportunity confidence in social entrepreneurship, emphasizing the significance of less formalized elements.
Szegedi et al. (2016)	Qualitative, Global context	CSR in a company plan is a social innovation. Corporate social responsibility (CSR) is an organization's proactive behavior to address societal concerns.	Explore an integrated model that balances economic, environmental, and social objectives in companies for sustainable development.
Baker, T., & Welter, F. (Eds.). (2015)	Qualitative, Global context	Research on entrepreneurship has a social and scientific component. Entrepreneurship and strategy support strategic entrepreneurship, focusing on wealth development. Entrepreneurship has a positive impact on personal, social, and financial well-being.	Focus on navigating the diverse landscape of entrepreneurship research, exploring emerging perspectives, core issues, and innovative methodologies to provide a comprehensive resource for scholars across disciplines.
Council, B. (2015)	Qualitative, Philippines	Social enterprises require specific skills to succeed.	Refine social enterprise definitions, address service gaps, explore private sector involvement in healthcare and education, and expand support, emphasizing awareness and information dissemination about social enterprise models.
Mswaka, W., & Aluko, O. (2015)	Mixed-method, UK	Social enterprises are exploring other forms of governance due to the limitations of democratic governance models.	Explore the implications of adopting stewardship governance in social enterprises, recognizing its departure from traditional models, and considering the complex non-profit economic landscape.
Azmat, F. (2013)	Qualitative, Bangladesh	Environmental sustainability positively affects the economy, society, and environment. WC (Waste concern) model effectively addresses social issues such as job development, community awareness, engagement, and women's empowerment.	Explore cases of successful social entrepreneurs in developing countries, examine the strategies and motivations behind their success, and conduct empirical studies to test the proposed model.
Daru, M. U., & Gaur, A. (2013)	Qualitative, Developing countries	Social entrepreneurs may benefit from inadequacies in the social assistance system. Social entrepreneurship can address societal issues that corporations and the government ignore.	Explore challenges in social entrepreneurship, including starting new organizations and promoting untested ideas. Empirical studies are needed to map the opportunity space and understand how social opportunities influence the entrepreneurial process.
Kahan, D. (2013)	Qualitative,	Farmers who start their businesses must be skilled at finding and	Research is needed to explore the impact of agricultural partnerships

	Global context	seizing opportunities to expand them. Farmer business management skills are necessary to deliver goods efficiently and sell products effectively.	and social entrepreneurship opportunities in the developing world.
Mair, J., Marti, I., and Ventresca, M. J. (2012)	Quantitative, Bangladesh	The findings demonstrate the importance of redefining market architecture and legitimizing new actors to build inclusive markets. Local political, community, and religious institutions can be used to examine voids through conflict and contradiction.	Explore the applicability of market-building processes identified in this rural Bangladesh study in diverse contexts, particularly in modern societies with demographic shifts, offering insights beyond U.S.-centric institutional studies.
Meldrim et al. (2012)	Qualitative, USA	The findings show two main groups controlling Worcester's farmer's market. Identify social innovations on farmers' markets to address Worcester's food security gaps.	Examine the impact of consolidating farmers' markets on revenue, growth, and competitiveness, guiding sustainable approaches for enhancing food security in diverse regions.
Miller et al. (2012)	Qualitative, USA	Compassion can promote social entrepreneurship, not just self-interest.	Explore how compassion influences social entrepreneurship, exploring its impact on organizational creation and developing market-based structures for societal betterment.
Santos, F. M. (2012)	Qualitative, Global context	Social entrepreneurship is a value-creation-focused economic innovation process that can take place in various contexts. The findings suggest a strategy to enhance capitalism and address modern society's most significant problems.	Explore the efficiency of social entrepreneurs in addressing neglected problems and reconsider the conceptualization of human behavior in free-market theory, advancing our understanding of social entrepreneurship in economic and strategic contexts.
Dacin et al. (2011)	Qualitative, Global context	The results suggest five potential areas for theory development: institutions, social movements, networks, culture, identity and image, and cognition.	Focus on institutions, networks, culture, identity, cognition, sense making, field-configuring events, motivation, and processes of serial social entrepreneurship, offering rich opportunities for scholars in organization science.
Schaltegger, S., and Wagner, M. (2011)	Qualitative, Global context	Market impact is measured by a company's market share, sales growth, and rival responses.	Explore links to institutional and evolutionary economics, investigate conditions for different entrepreneurial modes, and examine the transformation process from traditional social entrepreneurship to sustainable entrepreneurship.
Veidal, A., & Flaten, O. (2011)	Quantitative, USA	Farmer's market (FM) is a viable way to address falling pricing and challenging market conditions. Small-scale food producers can use FMs to gain access to consumer preferences and stay current with trends.	Explore how farm entrepreneurs choose market channels, emphasizing their entrepreneurial processes and performance, including subjective satisfaction measures and factors influencing the adoption and continuity of direct marketing channels.
Xie et al. (2011)	Quantitative, China	The rice-fish system is stable due to its interactions between rice and fish, improving the agricultural ecosystem and providing food security.	Explore the ecological and agricultural impacts of rice–fish culture, assess its applicability in various regions, and develop technologies for large-scale adoption,

			offering insights into sustainable and productive agricultural practices.
Astee, L. Y., & Kishnani, N. T. (2010)	Qualitative, Singapore	Rooftop gardening is a way to address food security and reduce the carbon footprint of food imports. Other benefits include improved health, environment, biofuel access, local identity, and community involvement.	Evaluate Singapore's policies, like "Landscaping for Urban Spaces and High-Rises" (LUSH), on building-integrated agriculture, exploring scalability and implications for sustainable urban development.
Hackett, M. T. (2010)	Qualitative, Bangladesh	Social entrepreneurship is in demand in developing countries, and research should focus on political elements to gain depth and complexity.	Explore how social enterprises in developing countries like Bangladesh address challenges such as informal economies and dependence on foreign donors. Additionally, there is a need for a more comprehensive discussion on diverse forms of local social enterprise movements in the developing world.
Short et al. (2010)	Mixed-method, USA	Social entrepreneurship involves providing products and services but also establishing new firms. Entrepreneurship helps businesses create value through innovation and knowledge.	Enhance the rigor of entrepreneurship studies by building on the insights from the featured research methods, striving to establish methodological standards comparable to other organizational sciences.
Yunus, M., Moingeon, B., & Lehmann-Ortega, L. (2010)	Qualitative, Bangladesh	CSR policies can be used to create social businesses but cannot be generalized to theory.	Assess social business performance, develop indicators for social profit, explore certification procedures, and conduct empirical inquiries into various social businesses beyond the Grameen Group to contribute to theory.
Pacheco, D. F., Dean, T. J., & Payne, D. S. (2010)	Qualitative, USA	Entrepreneurs who promote sustainable development use various tools in their entrepreneurial endeavors, including norms, property rights, government regulations, and collective action processes.	Explore how entrepreneurs use collective action and partnerships to overcome green prison challenges for sustainable development, examining the impact of creation opportunities on activity and positive externalities.
Short, J. C., Moss, T. W., & Lumpkin, G. T. (2009)	Mixed-method, USA	Entrepreneurship studies are essential for emerging sectors and can help solve problems with clear and practical advice.	Focus on the evolving role of social entrepreneurship in for-profit businesses, emphasizing the need to address challenges in constructing legitimacy and theoretical boundaries for enhanced understanding.
Zahra et al. (2009)	Qualitative, Global context	Identifying and exploiting opportunities requires careful societal, organizational, and individual variables analysis.	Refine definitions, explore opportunity costs, understand the motivations and actions of social entrepreneurs, and analyze antecedents, contextual variables, and ethical issues for theory-building and practical insights.
Certo, S. T., and Miller, T. (2008)	Qualitative, Global context	Social entrepreneurship and conventional conceptions of entrepreneurship differ. Social entrepreneurship is finding and seizing opportunities with a positive social impact.	Focus on defining the concept, understanding the significance of social missions, exploring entrepreneur characteristics and behaviors, studying social networks, investigating philanthropic venture capitalists' decision-making, and

		The need for empirical studies has limited understanding of social entrepreneurship outcomes.	conducting rigorous empirical studies on antecedents and outcomes.
Masseti, B. L. (2008)	Qualitative, Global context	Social entrepreneurship needs to be clearly and comprehensively defined to achieve widespread economic change.	Aim to enhance its societal impact by addressing the challenges arising from the lack of a clear definition and exploring strategies to improve its effectiveness in driving widespread economic change.
Nicholls, A. (Ed.). (2008)	Qualitative, Global context	Public officials are seeking guidance on how to encourage social entrepreneurship.	Focus on collaboration, value networks, and creating a dynamic global knowledge exchange platform in social entrepreneurship.
Mallick, S., & Siddiqui, R. (2007)	Quantitative, Indonesia	The results demonstrate the importance of predicting sustainable income, income distribution, and employment in Indonesia. Gross domestic product is deducted from environmental depreciation to calculate sustainable income.	Focus on the financial valuation of environmental issues in Indonesia, explore policy options for involving diverse income groups in funding environmental management, and investigate methods to make production technology more resource-efficient for sustainability and full employment.
Tracey, P., and Jarvis, O. (2007)	Qualitative, UK	The availability of resources is a primary driver of social venture franchising. Franchises for social ventures are unlikely to result in goal alignment due to limited resources and increased selection costs.	Explore alternative frameworks beyond resource scarcity and agency theories for social venture franchising. The trend of cross-sector franchising, especially between nonprofits and for-profits, presents a unique area for exploration in social entrepreneurship research.
Yunus, M. (2007)	Qualitative, Developing countries	Entrepreneurs use social enterprises to advance social objectives rather than their own.	Delve into the evolving landscape of social businesses, exploring their impact on pressing global issues such as poverty, homelessness, healthcare, and environmental protection.
Hartigan, P. (2006)	Qualitative, Global context	Starting a business aims to create transformative change rather than maximize shareholder returns.	Explore the impact and integration of hybrid for-profit and social businesses into mainstream corporate practices, focusing on balancing financial sustainability and social objectives.
Korosec, R. L., and Berman, E. M. (2006)	Qualitative, USA	Municipalities assist social entrepreneurs in getting funding, collaborating, and launching initiatives. Cities support social entrepreneurship differently, with 34.2% actively assisting private companies, 44.2% providing some aid, and 21.6% providing minimal assistance.	Investigate the influence of municipal support on social entrepreneurship, emphasizing the role of senior public managers and addressing data gaps, legal considerations, and the involvement of other jurisdictions.
Light, P. C. (2006)	Qualitative, Global context	A social entrepreneur seeks to change how governments, non-profit organizations, and companies approach social issues and challenges on a long-term basis.	Explore a broader definition of social entrepreneurship, considering teams, organizations, and different sectors to understand the factors facilitating sustainable, large-scale change.
Mair, J., and Marti, I. (2006)	Qualitative, Global context	Social entrepreneurship is an idea that catalyzes social change and addresses essential social needs without focusing on financial gain.	Focus on its independence, impact assessment, embeddedness, and various questions such as transferability, organizational

		Social entrepreneurship requires theoretical lenses to understand its emergence. c) Social entrepreneurship contributes to sustainability.	suitability, geographical clusters, institutional factors, and the link with sustainable development.
Perrini, F., and Vurro, C. (2006)	Qualitative, Global context	Social venture capitalists, social angels, and specialized consulting groups support initiatives.	Investigate drivers, analyze SEVs' behavior in critical areas, and scrutinize the alignment between theory and practice, prompting empirical inquiries for future exploration.
Robinson, J. (2006)	Qualitative, Global context	Social entrepreneurship can lead to interdisciplinary research and practical endeavors.	Explore the distinct characteristics of opportunities, investigate global and contextual variations, and analyze the rise in developed nations and the emergence of less-developed economies.
Sharir, M., and Lerner, M. (2006)	Mixed-method, Israel	Many variables, not just one, drive social entrepreneurs. Social entrepreneurship needs an infrastructure to access capital throughout its start-up period.	Employ qualitative and quantitative methods to explore factors contributing to the success of social ventures, focusing on larger sample sizes, and examining interdependencies among variables for additional insights and support.
Weerawardena, J., & Mort, G. S. (2006)	Qualitative, Australia	Social entrepreneurship model advances and implications for theory and practice.	Introduces a model for social entrepreneurship focusing on innovativeness, pro-activeness, and risk management. Future research should explore alignment strategies and competitive dynamics in the evolving landscape of social entrepreneurial organizations.
Seelos, C., and Mair, J. (2005)	Qualitative, Global context	Social entrepreneurs use innovative business models to address the unmet needs of people. Social entrepreneurship provides insights to create ethics and sustainable company models.	Include exploring collaborative models between social entrepreneurship (SE) and corporate social responsibility (CSR) for MDGs and understanding dynamics in public institutions' support for SE and collaborations with corporations.

In response to large-scale industrial operations' adverse social and environmental consequences, Mair et al. (2012) propose a collaborative approach between social entrepreneurs and local farmers to establish cooperatives or collectives. These initiatives prioritize small-scale, sustainable production methods, fair trade practices, and community engagement. While this model is touted for its potential to enhance animal health, welfare, and productivity and connect farmers with markets for sustainable products like organic or grass-fed beef (Pacheco et al., 2010), it is essential to assess its feasibility and impact critically. Challenges such as scalability, resource requirements, and the adaptability of these approaches to diverse local contexts warrant careful consideration.



Furthermore, promoting milk and beef consumption as part of a healthy diet to address food insecurity and malnutrition introduces another layer of complexity. Dzingirai (2021) suggests initiatives like school feeding programs, nutrition education campaigns, and developing value-added products like yogurt or cheese. However, the success of these interventions depends on their cultural appropriateness, considering variations in dietary habits, local preferences, and economic conditions. The potential unintended consequences, such as changes in traditional food practices or market saturation, should be critically examined.

While social entrepreneurship is heralded as a transformative force for creating a more sustainable and equitable milk and beef production model in developing countries (Mair & Marti, 2006), it is crucial to address inherent challenges. Innovative business models must genuinely meet the unmet needs of the population (Seelos & Mair, 2005), and the transformative change advocated by social entrepreneurship goes beyond traditional profit-driven approaches (Nicholls, 2008). Creating an infrastructure to facilitate access to capital during the start-up phase is highlighted as essential (Yunus et al., 2010), yet the practicalities of establishing and sustaining such infrastructure must be critically evaluated.

Furthermore, a comprehensive understanding of the opportunities, resource dynamics, and the need for clear definitions in social venture franchising is imperative (Certo & Miller, 2008; Sharir & Lerner, 2006; Thorgren & Omoredede, 2018). As we explore the potential positive impacts of social entrepreneurship in the agricultural sector, it is essential to approach these ideas with a nuanced perspective, acknowledging the complexities and potential challenges that may arise in their implementation.

## **2.3 Entrepreneurial ecosystem**

### **2.3.1 Introduction**

Entrepreneurial ecosystems have undergone a transformative journey from Tansley's biological context to Moor's business ecosystem, with subsequent refinements by various scholars. Mazzarol's (2014a) model highlights multifaceted dimensions, and Isenberg's (2011) framework identifies key components crucial for sustainable ecosystems. The theoretical frameworks presented by Malecki (2018), Spigel (2017), and Isenberg (2010), along with recent studies, underscore the global expansion and transformative impact of entrepreneurial ecosystems, emphasizing their pivotal role in socio-economic development (Mazzarol, 2014a; 2014b; Aarikka-Stenroos & Ritala, 2017).

The concept of an entrepreneurial ecosystem has been introduced by several researchers, each offering distinct definitions and boundaries. Tansley (1935) initially presented the concept within a biological context, while Moor (1993) introduced the first business ecosystem concept, refined by Trudgill (2007). Adner (2006) defined the innovation ecosystem, Prahalad (2005) defined the entrepreneurial ecosystem, and van der Borgh et al. (2012) clarified the latest knowledge-based ecosystem (Scaringella & Radziwon, 2018). Markard and Truffer (2008) focused on the technological aspect and purposes in defining the innovation ecosystem. Lastly, Berger and Kuckertz (2016) and Isenberg (2010) outlined an entrepreneurial and start-up ecosystem, emphasizing formal and informal actors supporting new business creation and growth (Maroufkhani et al., 2018).

Mazzarol (2014b) conceptualizes the entrepreneurial ecosystem as a model promoting entrepreneurship, small business growth, and innovation for economic development. This model encompasses government policy, funding, regulatory framework, mentors, culture, advisors, and support systems (Mazzarol, 2014a; 2014b). Similarly, Isenberg (2011) identified six ecosystem components—finance, culture, policy, support, human capital, and markets—that entrepreneurs can leverage to build sustainable ecosystems (Maroufkhani et al., 2018).

Illustrations by Malecki (2018), Spigel (2017), and Isenberg (2010) provide theoretical frameworks to understand entrepreneurial ecosystems in specific geographic areas, impacting clusters, businesses, and regulatory bodies (Neumeyer & Santos, 2018). Bernardez and Mead (2009) and Fernández Fernández et al. (2015) emphasized the significant impact of entrepreneurial ecosystems on socio-economic development, driving factors that support business incubators. Martin and Osberg (2007) demonstrated how ecosystems facilitate the establishment of new businesses, a sentiment corroborated by Roundy (2017), who affirmed entrepreneurial ecosystems as innovation clusters.

Bosma and Sternberg (2014) and Mair and Marti (2009) proposed resource categorization in the entrepreneurial ecosystem, including human capital, infrastructure, access to finance, and government support. Pratono and Sutanti (2016) confirmed that firms benefit from the external environment, while Roy et al. (2015) developed ecosystems, along with Heikkilä and Kuivaniemi's (2012) confirmation of the collaborative business and trust-building process benefiting all participants.

In the Gulf countries, a transformative phase of urban development is underway, marked by proactive governance, collaboration, and innovative city initiatives guided by supportive policies and stakeholder engagement (Ben Hassen, 2022). The World Bank's collaborative toolkit, developed with academics and practitioners, underscores local nuances and essential entrepreneurship enablers for digital entrepreneurship, demonstrating adaptability across diverse countries (Cruz & Zhu, 2023). Business ecosystem research, focusing on China's large enterprises through case studies and interviews, has seen a notable increase in articles. A bibliometric analysis identified Emerald as the top publisher, shedding light on emerging topics such as platform strategy and block chain (Rifa'i et al., 2023). The global expansion of entrepreneurship, coupled with its heightened role in the environment, is evident in the bibliometric analysis of entrepreneurial ecosystems literature, indicating a significant impact and demand providing valuable insights for scholars (Syed et al., 2023).

Furthermore, the study underscores a substantial positive impact of social incubators on social start-ups, surpassing start-up know-how, with efficiency gains exceeding 35%. Social start-ups in the food and ICT sectors, led by teams with business expertise, high education levels, subsidies, and a desire for company control, emerge as critical contributors (Sanchez-Robles et al., 2023).

Table 2.6 summarizes selected studies on the entrepreneurial ecosystem, encompassing the author(s), year, title, method/context, and key findings. The studies span from 1935 to 2023, beginning with the concept of the entrepreneurial ecosystem and covering various topics related to entrepreneurship, such as agricultural cooperatives, farm entrepreneurship, social entrepreneurship, and small farm systems. This collection of studies comprises qualitative (59), quantitative (11), and mixed methods (24) to examine food security. A detailed summary of the studies is contained in Table 2.6.

**Table 2. 6      Summary of selected studies on entrepreneurial ecosystem**

Author(s)	Method/Context	Key Findings	Future research directions
Syed, R. T., Singh, D., Agrawal, R., & Spicer, D. P. (2023)	Qualitative, Portugal	Entrepreneurship's global expansion and its exponential role in the environment have spurred a surge in research complexity. The bibliometric analysis of entrepreneurial ecosystems literature reveals a high impact and demand, providing valuable insights for scholars.	Delve into evolving entrepreneurial ecosystems, building on the complexity identified, and explore emerging trends to guide further research in this dynamic field.
Rifa'i, A., Raharja, S. U., Rivani, R., & Purbasari, R. (2023)	Quantitative, Global context	Business ecosystem research centres on China's large enterprises using case studies and interviews. Bibliometric analysis reveals a surge in articles, with Emerald as the top publisher, highlighting emerging topics like platform strategy and block chain.	Diversify research geographically, exploring business ecosystems in underrepresented regions and sectors. Shift to powerful databases like Scopus, Web of Science, and PubMed for specific, high-quality articles and comprehensive analysis.
Cruz, M., & Zhu, T. J. (2023)	Mixed-method, Global context	The World Bank's toolkit, co-created with academics and practitioners, emphasizes local nuances and vital entrepreneurship enablers for digital entrepreneurship. Its diverse success across countries highlights adaptability and effectiveness.	Extend toolkit application to more countries and sectors, refining diagnostic methods for evolving entrepreneurial dynamics. Its diverse success highlights the potential for global policy enhancement and strategic planning.
Sanchez-Robles, M., Soriano, D. R., Puertas, R., & Guaita Martínez, J. M. (2023)	Quantitative, Spain	The study highlights a significant positive impact of social incubators on social start-ups, exceeding start-up know-how, with efficiency gains surpassing 35%. Social start-ups in food and ICT sectors, led by teams with business expertise, high education levels, subsidies, and a desire for company control, emerge as critical contributors.	The study underscores the positive impact of social incubators on social start-ups and suggests future research directions, including exploring evolving needs at different growth stages and comparing social and traditional start-ups to inform policy decisions.
Ben Hassen, T. (2022)	Qualitative, Qatar	Gulf countries are undergoing transformative urban development, emphasizing proactive governance, collaboration, and innovative city initiatives, focusing on supportive policies and stakeholder engagement for successful implementation.	Prioritize a bottom-up approach for smart cities, integrating technology and human-centered solutions for sustainability.
Saghaian, S., Mohammadi, H., & Mohammadi, M. (2022)	Mixed-method, Iran	Entrepreneurship is essential for economic growth in developing countries. Entrepreneurship in the agriculture sector is essential for addressing employment and economic growth in developing countries.	Explore government policies' impact on agribusiness entrepreneurship success, emphasizing online methods and incentives to address study limitations and enhance robustness.
BBS (2021)	Mixed method (Annual statistical)	The findings show the importance of livestock in the gross domestic	Explore sustainable strategies for Bangladesh's growing livestock industry, considering

	report), Bangladesh	product, growth rate, and availability of milk and meat.	environmental and economic implications. Investigating technology's impact on productivity and farmer welfare can inform effective policy and development interventions.
GHI (2021)	Mixed method (Statistical information), Global Hunger Index	Tackling conflict, climate change, and COVID-19 is essential to address hunger. Action is needed to break the cycle of conflict and hunger.	Focus on identifying and addressing specific factors contributing to Bangladesh's moderate hunger levels and exploring targeted interventions for sustainable food security and nutrition improvement.
Global Food Security Index (2021)	Mixed method, (Statistical information), Global Food Security Index	Affordability shows that 37.4% of the world's population lives below the global poverty line. Agricultural research and development scores are low. Sustainability and adaptation score are 13.8 (water), 30.3 (oceans, rivers, and lakes) out of 100.	Explore targeted interventions to improve the affordability, availability, quality, safety, and sustainability of food in Bangladesh, addressing specific factors contributing to undernourishment, stunting, and other nutritional challenges.
World Bank (2021)	Mixed- method, World Bank Report	The population of Bangladesh in 2021 is in the millions, 169356.25.	Focus on in-depth analyses of Bangladesh's total population trends, considering demographic shifts, migration patterns, and socio-economic factors to inform effective policy and planning initiatives.
Morris, M. H., Santos, S. C., & Neumeyer, X. (2020)	Qualitative, Global context	Coordination and collaboration between the government and entrepreneurs are needed. Low-income entrepreneurs can take advantage of resource gifting, sharing, renting, co-marketing, and other forms of collaboration from local sources.	Examine the impact of coordinated public and community strategies, integrating financial incentives, training programs, and community resources to support entrepreneurship among low- income people, emphasizing sustained community-wide engagement and resource leverage.
BBS (2020)	Mixed method, (Annual statistical report), Bangladesh	The findings show the production, surplus and deficiency of products (milk and meat) per day/head.	Improve accuracy, relevance, and comprehensiveness through user feedback, exploration of new data sources, and addressing potential revisions for an up-to-date socio- economic portrayal.
Kuhl, L. (2020)	Qualitative, Honduras	Resources are needed to transfer technologies to smallholder farmers to increase resilience and adaptability.	Optimize technology transfer for climate adaptation among smallholder farmers, considering diverse needs and addressing barriers for sustained adoption, emphasizing the importance of 'software' costs and effectiveness in resilience pathways.
Liverpool- Tasie et al. (2020)	Qualitative, Global context	Small-scale farmers can benefit from training and skill development to increase their production.	Explore the impact of non- contract interactions between small-scale farmers and value chain actors, particularly small and medium enterprises, to understand their effects on farmer livelihoods and the achievement

			of Sustainable Development Goal 2.
Khanal et al. (2020)	Qualitative, Nepal	Key stakeholders are involved in developing public-private entrepreneurship, commercialization, increased institutional capacity, and integrating research results into policy review. Agriculture development is multidimensional and multi-sectoral, with other sectors important.	Assess the effectiveness of Nepal's Agricultural Development Strategy, emphasizing a bottom-up approach, public-private partnerships, and institutional capacity for sustainable growth, requiring supporting policies and active stakeholder participation.
Abu Hatab, A., Cavinato, M. E. R., & Lagerkvist, C. J. (2019)	Qualitative, Developing countries	More comprehensive models are needed to capture and integrate empirical evidence on food security. Livestock production systems can be improved to adapt to urbanization in developing countries.	Focus on bridging gaps in fragmented literature on livestock, food security, and urbanization, considering policy impacts, multidimensional food security, and complexities in livestock value chains while emphasizing waste reduction for sustainable production.
BBS (2019)	Mixed method, (Annual statistical report), Bangladesh	The findings show the demand, production, deficiency, and availability of products (milk and meat) per day/head.	Bangladesh Bureau of Statistics (BBS) involves enhancing data collection with digital tech, analyzing household income's impact on poverty, and evaluating decentralized statistical offices.
Global Food Security Index (2019)	Mixed method, (Statistical information), Global Food Security Index	The Food Security Environment of Bangladesh shows four parameters such as affordability, availability, quality, and safety, stability, and adaptation score.	Address food security by improving food system affordability, availability, quality, safety, and sustainability to combat undernourishment, child stunting, underweight, and obesity.
Roy, D., Sarker Dev, D., & Sheheli, S. (2019)	Qualitative, Bangladesh	Bangladesh faces many challenges in achieving food security. Nutritional health needs to be addressed in the country.	Focus on studying the impact of agricultural diversification and climate change adaptation strategies on food security in Bangladesh, as well as conducting nutritional studies to address the country's neglected aspects of human health.
Yearbook (2019)	Mixed method, (Statistical Yearbook 2019), Bangladesh	Consumption, household income and expenditure, Food Intake (Gram Per Capita Per Day), Calorie (K. Cal/Capita/Day), Labor and Employment, Different Agriculture Censuses	Include studying the economic development and environmental impact of Bangladesh's expanding communication and transportation systems, as well as analyzing the effectiveness of the country's foreign policy in promoting peace and global justice.
Taku-Forchu, N. (2019)	Mixed-method, Cameroon	Low wages and high migration make labor easier to find. Farmers lack access to market information, making the price of agricultural products challenging. Market information, infrastructure, and low prices are critical challenges in the value chain.	Include studying the recommended strategies' impact on smallholder farmers' income and livelihoods and examining the effectiveness of extension services in facilitating market linkages for smallholder farmers in other agricultural sectors in Cameroon.

		Linking smallholder farmers to markets is essential for their livelihoods.	
Country Profile (2018)	Mixed method, (World Bank Report), Global context	Remittance inflows were a major contributor to Bangladesh's GDP growth in 2018-2019.	Include analyzing the relationship between rainfall patterns and climate change impacts to understand better and predict potential effects on the environment and various sectors, such as agriculture and water resources management.
Malecki, E. J. (2018)	Qualitative, USA	Entrepreneurship is the creation of new firms through the support of the ecosystem and existing and prior entrepreneurs.	Focus on understanding the evolution of entrepreneurial ecosystems in different geographical contexts and examining the heterogeneity of entrepreneurship within these ecosystems.
Maroufkhani, P., Wagner, R., & Ismail, W. K. W. (2018)	Qualitative, Global context	Entrepreneurs need to create strong networks and collaborate to create a prosperous environment. The findings show crowdsourcing, industrial dynamics, and subdomain incubator funding in finance. Gaps in quantitative modelling and survey-based research can challenge entrepreneurial ecosystems.	Assessing the effectiveness of different types of crowdsourcing in creating a favorable entrepreneurial ecosystem, exploring how industrial changes impact the productivity of entrepreneurs, and investigating other sources of funding for entrepreneurship.
Neumeyer, X., and Santos, S. C. (2018)	Mixed-method, USA	To integrate concepts from literature to understand sustainable business models in entrepreneurial ecosystems. Developing sustainable business models requires a supportive entrepreneurial ecosystem.	Explore the components, norms and values, success factors, and measurement of sustainable entrepreneurial ecosystems, as well as the impact of digitalization and online sources on these ecosystems.
Scaringella, L., & Radziwon, A. (2018)	Qualitative, Denmark	The four main types of ecosystems are business, innovation, entrepreneurial, and knowledge ecosystems. Identify invariants across diverging streams from an ecosystem and territorial approaches.	Identify future research directions in the ecosystem field to strengthen theoretical foundations and guide further investigations for the sustainable development of territories and industries.
Fitz-Koch, S., Nordqvist, M., Carter, S., & Hunter, E. (2018)	Qualitative, Global context	In traditional agricultural communities, producers aim to abide by local customs and values, establishing formal and informal institutions that aid and limit entrepreneurial efforts. The social norms and informal institutional environment are crucial in legitimizing farmers' efforts to establish new business ventures. Identity, family, and institutions greatly influence agricultural entrepreneurship and opportunities.	Explore the factors driving opportunity recognition and venture creation, the motives and rewards of agricultural entrepreneurship, and the exit process while utilizing context-sensitive theories to analyze entrepreneurial phenomena.
Aarikka-Stenroos, L.,	Qualitative, Global context	The research identifies four aspects of the ecosystem approach: value co-creation, emergence and	Explore the integration of diverse disciplines, expand the depth and breadth of analysis, and advance

and Ritala, P. (2017)		disruption, stable business exchange, and competition and evolution.	methodologies to comprehend and manage ecosystem-based business and innovation, including incorporating computational social science and simulation studies for understanding B2B market dynamics.
Collier, P. (2017)	Qualitative, Global context	Developing countries are experiencing a decline in living standards. b) The leading causes of failure are a civil war, dependency on natural resources, and poor governance.	Include exploring effective strategies to address the four traps identified by Collier, developing innovative governance models, and investigating the impact of globalization on the bottom billion's economic development.
DAE (2017)	Mixed method, (DAE Report), Bangladesh	Agricultural Extension provides efficient and effective services to support sustainable agricultural and socioeconomic development.	Include assessing the impact and barriers of the previous strategic plan and developing strategies to enhance stakeholder engagement and commitment.
Rahman (2017)	Qualitative, Bangladesh	Bangladesh is experiencing a loss of agricultural land due to urbanization and industrialization. Bangladesh is facing food insecurity due to urbanization and population growth.	Focus on evaluating the impact of innovative technologies and practices, such as precision agriculture and sustainable farming methods, on improving agricultural productivity, reducing resource use, and mitigating the effects of climate change in Bangladesh.
Roundy, P. T. (2017)	Qualitative, USA	The ecosystem offers tools, infrastructure, support, and educational opportunities. Social entrepreneurship is moving away from creating social value. Social entrepreneurs are essential to entrepreneurial ecosystems and social problems.	Explore the empirical relationships between social entrepreneurship and entrepreneurial ecosystems, using quantitative and qualitative methods, and further investigate the role of entrepreneurial ecosystems in revitalizing stagnant economies and addressing societal challenges.
Spigel, B. (2017)	Qualitative, USA	Ecosystems provide benefits and resources to entrepreneurs. Theory of ecosystems is needed to understand their structure and influence on entrepreneurship. Ecosystem attributes are unique to each region and not generalizable. Research on ecosystems requires focusing on internal dynamics and economic development.	This research directions in entrepreneurial ecosystems: (1) Developing theoretical frameworks to understand ecosystem emergence and change dynamics, and (2) Creating metrics for comparing ecosystem attributes across regions.
Chowdhury, M., & Alam, Z. (2017)	Mixed-method, Bangladesh	SMEs in Bangladesh face high-interest rates, lack of collateral security, corruption, and unfavorable credit terms. Firms' financial and owners' characteristics all affect access to finance.	Explore new avenues for providing non-collateral-based financing options to SMEs while addressing corruption within financial institutions and examining the impact of finance access on the growth and development of SMEs.
FAO (2017)	Qualitative, Global context	To make the most of new prospects, farmers require access to advanced technologies that enhance productivity and improved	Focus on understanding the impacts and outcomes of agro-territorial initiatives and identifying the most effective



		means of transportation, information, investment loans, and training to acquire skills.	policy measures and institutional arrangements for successful implementation.
Okeke, C., & Nwankwo, F. (2017)	Mixed-method, Nigeria	Rural entrepreneurs need more financing and government support to succeed.	Include exploring the effectiveness of government support and infrastructure provisions in promoting rural entrepreneurship and investigating the impact of connecting rural entrepreneurs to external markets on their competitiveness and success.
Tchamyou, V. S. (2017)	Quantitative, Africa	KE (knowledge economy) policies can increase business creation and operations in Africa. Policy implications for KE dimensions in African business to reduce unemployment and improve competitiveness.	Include examining the long-term effects of KE on African businesses and further exploring the relationship between KE components and specific business indicators.
BBS (2016)	Mixed method, (annual statistical report), Bangladesh	The findings show per capita consumption, household income and expenditure in 2016.	Include analyzing the impact of climate change on agricultural production in Bangladesh and studying innovative approaches to improving the efficiency and sustainability of agricultural practices in the country.
Berger, E. S., and Kuckertz, A. (2016)	Qualitative, Global context	Women with startup experience are likelier to start businesses if they can access female employees. Access to female employees familiar with startups can lead to increased risk-taking and entrepreneurial activities.	Explore the effectiveness of gender-specific public policies in increasing female entrepreneurship rates in technology startups and investigate the role of national-level policies in supporting gender equality in entrepreneurial ecosystems.
Pratono, A. H., and Sutanti, A. (2016)	Qualitative, Indonesia	Entrepreneurship in social enterprises differs from for-profit institutions. Public policy plays an essential role in social enterprise.	Explore the impact of public policy on the growth and development of social enterprises in different contexts, as well as the potential conflicts and trade-offs that may arise when social enterprises prioritize economic goals.
White, D., Quinney, M., & Jarvis, A. (2016)	Qualitative, Bangladesh	To support technological, institutional, and policy advancements to improve Bangladesh's diet. To increase agricultural productivity, adapt to climate change, reduce emissions, and reduce greenhouse gas emissions	Include evaluating the impact of incorporating CSA concepts in policy support mechanisms and assessing the effectiveness of partnerships with other donors and development organizations in enhancing self-sufficiency and promoting climate-smart agriculture in Bangladesh.
Chand, P., Sirohi, S., and Sirohi, S. K. (2015)	Quantitative, India	Smallholder farms need operation-specific mechanical technologies to improve efficiency and reduce drudgery. Women are essential for smallholder dairy farms to be socially sustainable.	Involve validating and expanding the farm-level sustainability assessment model to include other agricultural and allied activities and exploring the attribute indices' potential policy implications and impact on sustainability improvement.

FAO (2015)	Mixed method, (Annual report), FAO	Agriculture and social protection are essential for reducing poverty and hunger. Agricultural interventions are needed to address supply-side bottlenecks.	Include examining the long-term impacts of social protection and agricultural programs on poverty and food security and identifying strategies to effectively integrate and coordinate these programs at the national and sub-national levels.
Fernández Fernández, M. T., Blanco Jiménez, F. J., and Cuadrado Roura, J. R. (2015)	Qualitative, Global context	Business incubators are innovative tools that ensure the future of service delivery. Entrepreneurship in Spain is driven by necessity because of the economic crisis.	Include further analysis of networking experiences in business incubators in different countries and the development of strategic network models for incubators.
Fragouli, E., & Xristofilaki, K. (2015)	Mixed-method, Greece	Organizational leadership, adaptability, and program capacity are essential to sustainable social responsibility development. Sustainability is a formula that can help businesses establish sustainable CSR programs.	Include an investigation into the long-term impacts of power stations on the social, economic, and environmental aspects of surrounding areas. Explore potential mitigation measures and strategies for improving the well-being of affected communities.
Habiba, U., Abedin, M. A., & Shaw, R. (2015)	Mixed-method, Bangladesh	Promoting productivity growth, resource access, land tenure, returns to labor, and education can help address urban food insecurity in Bangladesh. Resource-poor farmers/fishers/herders are more vulnerable to disasters due to climate change, with half of the rural children suffering from malnutrition.	Include an exploration of the effectiveness of integrating disaster risk reduction and climate change adaptation strategies in Bangladesh's agricultural sector. Identify innovative approaches to enhance resilience and sustainability.
Huq, N. (2015)	Qualitative, Bangladesh	Climatic conditions impact agriculture production. Farmers face challenges marketing their products.	Focus on further investigating issues related to marketing, such as collection, transportation, and financial support for crop failures, as well as exploring the availability and promotion of climate-resilient seed varieties.
Krause et al. (2015)	Qualitative, Global context	The people-policy gap leads to unequal benefits, disconnection, and detrimental health and food security effects.	Focus on bridging disciplinary and sectoral barriers, enhancing stakeholder participation, and assessing aquaculture's economic and environmental impacts to enable context-appropriate and sustainable management.
Roy et al. (2015)	Qualitative, UK	Social enterprise activity is excluded from public sector contracts due to reluctance to open services to community-based providers. Policy interventions supporting social enterprise have been challenging to understand.	Examine the potential impact of the public sector's dependence on social enterprises in Scotland. Explore strategies for increasing the diversity and inclusivity of the social enterprise sector about class and population size.
Elias, S., Ahmad, I.	Mixed-method, India	Access to agricultural credit is determined by age, gender,	Include investigating how education level, land size,

M., & Patil, B. L. (2015)		education, family size, landholdings, irrigation facilities, income level, marital status, and occupation. Minor landholders have less access to agricultural credit due to land size, education, irrigation facilities, income, and gender.	irrigation facilities, income level, and gender affect access to agricultural credit and exploring potential interventions or policies to increase credit accessibility for small and marginal farmers.
Bosma, N., and Sternberg, R. (2014)	Quantitative, European countries	Urban entrepreneurship differs from other regions due to individual characteristics and contextual factors. Urban entrepreneurship is the focus of the study, not other areas.	Includes examining the heterogeneity of large urban areas regarding their role in innovation and entrepreneurship and investigating the causality of the relationships studied in this paper using case studies and longitudinal designs.
Lemma, H. (2014)	Qualitative, Ethiopia	Lack of institutional support hinders livestock entrepreneurship. Consumers demand high-quality food, animal care standards, and environmental compliance.	Include analyzing the impact of entrepreneurship education on career choices in the livestock industry while investigating the outcomes and experiences of recent higher education graduates in self-employment to identify best practices for business development and lessons learned from successful livestock entrepreneurs.
Mason, C., and Brown, R. (2014)	Qualitative, Netherlands	The policy cannot influence the development of an entrepreneurial ecosystem. Policymakers can develop metrics to assess ecosystems' strengths and weaknesses, identify interventions, and monitor their effectiveness. High-growth firms contribute to economic growth and need to be fostered to create blockbuster entrepreneurship opportunities.	Explore the effectiveness of customized and collaborative business support in fostering entrepreneurial ecosystems, the impact of government interventions on ecosystem development, and ways to address spatial and internal inequalities that may arise from thriving entrepreneurial ecosystems.
Mazzarol, T. (2014a)	Quantitative, Australia	SME financing studies focus on working capital management, profitability, growth, and financial management. Working capital is essential for successful start-ups and growing firms.	Focus on understanding how different factors impact cash flow and working capital management in businesses and should aim to apply findings to practical outcomes like educational programs and policy suggestions for SMEs.
Mazzarol, T. (2014b)	Quantitative, Australia	Creating sustainable entrepreneurial ecosystems requires attention to a range of factors. Leadership by government Ministers is essential for building entrepreneurial ecosystems from existing industries.	Include examining the effectiveness of government policies in fostering and sustaining entrepreneurial ecosystems and exploring the impact of different approaches, such as top-down and bottom-up strategies, on the growth and support of entrepreneurial firms.
Mazzarol, T. (2014a)	Qualitative, Australia	Small businesses require a transactional approach, while entrepreneurship requires a more relational approach.	Focus on identifying and analyzing the most effective strategies for governments to optimize infrastructure and regulatory frameworks to foster a

		Entrepreneurial ecosystems foster economic development through entrepreneurship, innovation, and small business growth.	healthy entrepreneurial economy and ensure long-term prosperity.
Van Wijk et al. (2014)	Qualitative, Global context	The finding shows that models evaluated for short-term food security under climate variability and climate change. Production-oriented models need to incorporate knowledge from other research fields.	Focus on developing farm household models for climate-resilient agriculture, integrating adaptive decision-making, risk analysis, and socioeconomic considerations while employing decision theory and dynamic mathematical programming for robust evaluations of climate change effects and adaptive strategies.
Bote, D., Mago, S., & Hofisi, C. (2014)	Qualitative, Zimbabwe	Rural individuals require access to credit for diverse purposes, whether for short-term or long-term needs. The Cattle Bank approach offers a creative means to supplement other models, such as mobile banking, informal finance, and savings.	Evaluate Cattle Banking's scalability in rural finance, addressing financial challenges for a significant rural population and exploring broader economic growth implications by expanding the model to include other livestock.
Ahammad, I., & Moudud-Ul-Huq, S. (2013)	Qualitative, Bangladesh	Support from government and non-government institutions is needed to support women entrepreneurs. Financial institutions offer credit to women entrepreneurs but need more resources.	Evaluate the impact of government-backed financing and policy effects on women entrepreneurship in Bangladesh, addressing barriers like skill development and infrastructure for sustainable growth. Investigating tax incentives and quality-focused research for women-led enterprises is essential.
Gillespie, S., & Kadiyala, S. (2012)	Mixed-method, India	India's undernutrition problem is rooted in systemic factors affecting the entire population. Data audit to identify gaps and overlaps in survey data.	Build representative datasets to explore the links between recent agricultural shifts and the nutritional status of women and children in India, which is crucial for informed policy formulation and unlocking agriculture's potential to reduce undernutrition.
Heikkilä, M., and Kuivaniemi, L. (2012)	Qualitative, Finland	An entrepreneur pushes the business initiative moving forward.	Expand the business ecosystem by collaborating across technology fields, focusing on critical elements like technology, research, customer demands, competitors, social environment, and legal aspects to achieve measurable gains and societal impact in health and growth venturing.
Van der Borgh et al. (2012)	Qualitative, Netherlands	The ecosystem's business model is essential for innovation and entrepreneurial fitness. Firms' performance in an ecosystem is driven by their business models and the ecosystem's business model.	Explore the findings' applicability in mature and emerging ecosystems, assess alternative theoretical perspectives, and conduct in-depth case studies on business model realignment to understand competitive advantage

			and value capturing comprehensively.
Haider et al. (2011)	Quantitative, Bangladesh	Redefining and redesigning the credit instrument is necessary to maintain sustainability and increase production levels. The government and others need to take steps to improve the farming experience of farmers to improve efficiency.	Investigate policy impacts on enhancing agricultural efficiency in Khulna, focusing on factors like farming experience, credit availability, education, and land tenure and considering the introduction of absent factors such as cooperative farming and irrigation.
Isenberg, D. (2011)	Qualitative, USA	Entrepreneurship is about profit-seeking ambition and contributing to the economy and society. The task of the policymaker and public leader is to create a virtuous cycle of entrepreneurship.	Explore industry specialization/diversification balance, nonprofit and specialist support strategies, and methods to inspire corporate employee participation and mitigate venture capital barriers in entrepreneurial ecosystems.
Shiferaw, B., Hellin, J., & Muricho, G. (2011)	Quantitative, Sub-Saharan Africa	Farmers can increase productivity and commercialization of smallholder agriculture to ensure food security. Farmer organizations provide economic coordination and access to smallholder farmers, reducing transaction costs.	Address challenges like market opportunity identification and governance to enhance farmer organizations' economic viability. Balancing agribusiness focus, social inclusiveness, and fostering private sector partnerships is crucial for promoting agricultural productivity and food security in Africa.
BBS (2010)	Mixed method, (Annual statistical report), Bangladesh	The findings show per capita consumption, household income and expenditure in 2010-2011.	Include expanding surveys to cover emerging health and technology indicators and evaluating the impact of agricultural policies presented in the Yearbook of Agricultural Statistics.
Isenberg, D. J. (2010)	Qualitative, USA.	Entrepreneurship fosters economic growth by involving the private sector, reducing regulatory obstacles, enacting supportive laws, emphasizing clusters and incubators, and submitting financing schemes to market pressures.	Delve into optimal government interventions for organic cluster growth and assess the lasting effects of legal reforms on entrepreneurship, exploring dynamic ecosystem relationships and cultural influences.
Mondal, M. A. L. (2010)	Qualitative, Bangladesh	The government failed to maintain food grain stocks, sending the wrong signal to the market. Climate change and global warming affect food production in Bangladesh.	Explore sustainable strategies for addressing food security challenges in Bangladesh, considering the impact of population growth, climate change, and the revitalization of family planning programs to ensure comprehensive solutions.
Thornton, P. K. (2010)	Qualitative, Kenya	Population growth, income growth, urbanization, and science and technology advancements increased the demand for livestock products. Livestock production can be more active in developed nations.	Address the sustainable intensification of livestock production amidst environmental challenges and assess its impact on poverty alleviation in smallholder systems, considering the evolving global food security landscape.

		Climate change significantly impacts livestock and mixed systems in emerging nations.	
Truffer et al. (2010)	Qualitative, Switzerland	Strategic planning is essential for achieving sustainable transitions in infrastructure.	Evaluate the effectiveness of the RIF's method in fostering sustainability transitions in infrastructure, examining its impact on decision-making and scalability for bottom-up reforms in established socio-technical regimes.
Markelova, H., & Mwangi, E. (2010)	Qualitative, Africa	Collective action can help African smallholders exploit new value chains and address market imperfections. Collective marketing for smallholders requires considering markets, products, user groups, institutional arrangements, and the external environment.	Explore the nuanced effects of collective marketing, addressing potential drawbacks for non-participants, distributional consequences, and scalability for widespread benefits among smallholders.
Birner, R., & Resnick, D. (2010)	Qualitative, Global context	Smallholder agriculture policies can help achieve pro-poor growth by correcting market failures.	Delve into the political economy of pro-poor agricultural policies, assess global trends' impact on smallholder strategies, and conduct case studies for nuanced insights, particularly in Africa, guiding practical development approaches.
Bernardez, M., and Mead, M. (2009)	Qualitative, Global context	Analyzing and improving ecosystem performance can minimize business cycles and reduce systemic risks.	Focus on assessing the effectiveness of entrepreneurial ecosystems through shared visions, strategic planning, and innovative methodologies, exploring their impact on social and economic outcomes.
Deb, U., Hossain, M., & Jones, S. (2009)	Qualitative, Bangladesh	Bangladesh experienced rising food prices, leading to poverty and food insecurity, particularly for the most vulnerable.	Focus on the impact of international trade policies, irrigation methods, and comparative advantages on Bangladesh's rice and wheat production. Resolving the debate on food grain demand and production estimates is essential for accurate policy formulation.
Mair, J., and Marti, I. (2009)	Qualitative, Bangladesh	The findings show engagement in sense-making, political nature, and unintended consequences. Institutional voids are caused by resource constraints and an institutional fabric often at odds with market development.	Investigate how actors navigate institutional voids to bring about change, explore unintended consequences of bricolage, and delve into the micro-level actions of social entrepreneurs in poverty reduction, offering valuable insights for development and policy.
Yunus, M. (2009)	Qualitative, Global context	Social entrepreneurship encourages people to take action to address problems that still need to be addressed. Social businesses create social benefits and be owned by the poor or disadvantaged.	Explore the scalability and sustainability of social businesses in addressing global challenges like poverty, inequality, and environmental issues, offering insights into their effectiveness and long-term impact.

FAO (2008)	Qualitative, FAO	A short chain of food production is essential for food security in many households practicing rainfed agriculture. The climate is a major factor in food system performance, affecting production and income.	Explore conservation agriculture's scalability and long-term impact, particularly its role in carbon sequestration and climate change mitigation, while considering potential trade-offs, such as nitrous oxide emissions from cover crops.
Markard, J., and Truffer, B. (2008)	Qualitative, Switzerland	The findings clarify policy and strategy implications, performance comparisons, and alternative trajectories for radical innovations.	Empirically validate the integrated framework merging innovation systems and multilevel perspectives across various technological domains to assess its applicability, benefits, and challenges in explaining radical innovation processes.
Devendra, C. (2007)	Qualitative, Asian countries	Natural resource management at the community level offers opportunities and economic benefits. A practical policy framework and improved infrastructure are needed to support small farm systems.	Explore policies promoting the resilience and diversification of small farms in Asia, emphasizing their crucial role in sustainable natural resource management and food production amid global challenges.
Martin, R. L., and Osberg, S. (2007)	Qualitative, USA	Social entrepreneurship is differentiated from social service provision and activism, allowing for hybrid models.	Clarify and define social entrepreneurship's distinct value and impact, differentiating it from service provision and activism to guide informed decision-making.
Trudgill, S. (2007)	Qualitative, UK	An ecosystem comprises dangerous components such as climate, soil, and organisms. Ecosystems are vulnerable due to dangerous components and invasion by other systems.	Refine concepts like autogenic and allogenic successions, climaxes, and ecosystems in vegetation dynamics, emphasizing their implications for stable equilibrated systems and the influence of decisive biotic factors like continuous grazing.
Onumah, G., Davis, J., Kleih, U., & Proctor, F. (2007)	Qualitative, UK	Smallholder farmers require revised policies to overcome challenges, especially in developing countries. Governments can accelerate the process of making changes to laws and regulations, support emerging types of producer associations, and reinforce connections with top-level organizations.	Focus on policy reforms for smallholder-friendly market innovations, explore aligned public/donor investments, and strengthen farmers' producer organizations to enhance resilience in evolving markets.
Adner, R. (2006)	Qualitative, Global context	Ecosystem maps are essential for assessing options and prioritizing opportunities.	Explore strategies for managing ecosystem risks in innovation, considering market-specific challenges, prioritizing opportunities, and assessing the impact of different leadership roles in guiding ecosystem development.
DAE (2006)	Mixed-method, Bangladesh	DAE ensures equitable access to resources such as seeds, fertilizers, credit, and farmer cards for women in agriculture.	Include industry-specific impacts of ecosystem risks on innovation strategy and assess leadership's role, emphasizing emerging markets and external factors

			influencing complementary innovations.
McElwee, G. (2006)	Quantitative, UK	Farmers need economic support and education to develop entrepreneurial skills. The role of the farmer and the impact of new activity on the core agricultural business determines diversified activity.	Explore neglected areas such as business strategies, general skills, and the role of women entrepreneurs to inform more effective policy development for the agricultural sector.
McElwee, G., & Robson, A. (2005)	Qualitative, UK	Farm entrepreneurship and entrepreneurial skills, barriers, and policy implications are discussed. The findings show limited trends in farm diversification and entrepreneurship. Limited contributions to business strategies, women farm entrepreneurs, support, and clustering exist.	Focus on mapping essential skills amidst CAP changes and adaptation challenges to inform policy and support farmers in a dynamic agricultural landscape.
Prahalad et al. (2005)	Qualitative, Global Context	Entrepreneurship is essential for reducing poverty. Market-based solutions cannot lead to poverty reduction and economic development.	Focus on private-sector collaboration with the bottom of the pyramid (BOP) to eradicate poverty, emphasizing inclusive capitalism and breaking the dominant logic for sustainable outcomes.
Prahalad C.K. (2005)	Qualitative, USA	The market faces a challenge in combining low cost, good quality, sustainability, and profitability. Farmers benefit from the sourcing arrangement, eliminating intermediaries.	Delve into innovating new products and services for the bottom of the pyramid, emphasizing experimentation, dignity, choice, and trust-building between private-sector firms and BOP consumers for mutual benefits.
International Food Policy Research Institute (2004)	Qualitative, Global Context	Microfinance institution focused on agricultural sector to address finance gap.	Investigate the comprehensive impact of employing microfinance for agricultural finance, considering the benefits and risks outlined by the International Food Policy Research Institute.
Delgado, C. L. (2003)	Qualitative, Developing countries	Smallholder farmers have access to a growing market and micronutrients and calories. Increasing production alone will not address protein and micronutrient deficiencies in developing countries.	Investigate the Livestock Revolution's socioeconomic and environmental effects in developing countries, emphasizing market distortions, smallholder participation, and sustainable practices for poverty alleviation and improved nutrition.
Rasul, G., & Thapa, G. B. (2003)	Qualitative, Southeast Asia	Shifting cultivation deprives people of resources and sustenance. Population development or state authority cannot control shifting cultivation.	Focus on understanding the dynamics of shifting cultivation in South and Southeast Asia, exploring factors like land tenure, infrastructure, and support services, and developing effective control strategies, including land ownership rights and market integration.



Moor, J. F. (1993)	Qualitative, USA	The findings show managers can design longevity in an ecosystem by micro-segmenting markets and creating close customer relationships. Executives require to develop new ideas and tools to strategize, make decisions, and lead.	Investigate the dynamics and strategies within business ecosystems, focusing on co-evolution, survival factors, and competitive dynamics to guide effective management in a rapidly changing business environment.
Muneer, S. E. T. (1989)	Quantitative, Western Sudan	Agricultural income is the most significant predictor of household living expenditures. Household economic status has a negative effect on agricultural laborers.	Utilize longitudinal data to assess the impact of cooperative participation on small farmers' development, conduct a comparative study on various cooperative types, and explore innovation tendencies across social classes within cooperatives.
Tansley, A. G. (1935)	Qualitative, UK	Succession and development are essential for equilibrating ecosystems. The ecosystem is a physical system of the universe.	Explore the impact of autogenic and allogenic factors on ecosystem dynamics and stability. Investigating the relevance of the "biotic community" concept in understanding animal influences on vegetation is crucial.

In summary, establishing a well-defined entrepreneurial ecosystem is indispensable, particularly considering researchers' diverse definitions and delineations. The various components constituting an entrepreneurial ecosystem, including policy, finance, culture, support systems, infrastructure, human capital, and market dynamics, emerge as critical pillars for farm-based social entrepreneurs. These elements are not only vital individually but are also intricately interrelated, collectively shaping the landscape for sustainable food production, and contributing significantly to the overarching goal of enhancing food security within a nurturing and supportive entrepreneurial environment.

Policy frameworks within the entrepreneurial ecosystem act as guiding principles, influencing the regulatory environment for farm-based social entrepreneurs. The availability of financial resources plays a pivotal role, providing the necessary capital for innovation, growth, and resilience in agricultural ventures. Cultural factors influence practices and acceptance within communities, contributing to successfully integrating sustainable agricultural methods. Robust support mechanisms, encompassing mentorship, networking opportunities, and knowledge exchange, empower social entrepreneurs to navigate challenges effectively.

Moreover, the importance of infrastructure must be balanced, encompassing everything from efficient supply chains and technology access to reliable transportation networks. Human

capital, representing the knowledge, skills, and expertise of individuals involved in agricultural endeavours, forms the bedrock for innovation and productivity. Finally, local, and global markets serve as avenues for the distribution and consumption of sustainably produced food, thereby influencing the overall success and impact of farm-based social entrepreneurship.

In essence, the synergy of these entrepreneurial ecosystem components provides a holistic framework that supports the endeavours of farm-based social entrepreneurs and fosters a sustainable and resilient approach to food production, contributing significantly to the broader objectives of global food security.

### *2.3.2 Entrepreneurial ecosystems and social entrepreneurship*

Social entrepreneurship is an integral part of the entrepreneurial ecosystem. Social entrepreneurs, entrepreneurial ecosystems, public goods, services provision, infrastructure development, and food security are interrelated. The level of poverty depends on sustainable production, and food security is linked to social entrepreneurs and entrepreneurial ecosystems (FAO, 2015).

Social entrepreneurship plays a crucial role in promoting agricultural productivity and economic growth. It is vital to reducing poverty and improving food security worldwide (Collier, 2017). Social entrepreneurship supports the rural economy and enhances agricultural productivity, leading to economic growth through entrepreneurial ecosystems. These ecosystems encompass finance, culture, support, human capital, and market, mobilizing resources, identifying opportunities, and facilitating mutual benefits exchange among different actors (Mason & Brown, 2014).

### *2.3.3 Entrepreneurial ecosystems, sustainable food production and food security*

Entrepreneurial ecosystems contain many elements including policy, finance, culture, support, human capital, and markets (Mazzarol, 2014a; Isenberg, 2011). They can mobilize resources, identify opportunities, and exchange mutual benefits among different actors, promoting agricultural productivity and economic growth (Mason & Brown, 2014). Entrepreneurs are the key actors within these systems. In social agripreneurial ecosystems, the social agripreneurs are critical in promoting sustainable agriculture and increasing economic growth especially in many countries with high food insecurity.

Given that reducing poverty and enhancing food security for over a billion people worldwide is essential (Collier, 2017), the role of entrepreneurial ecosystems need to be better understood to ensure better food security outcomes. In Africa, livestock-based enterprises are essential for reducing poverty and enhancing sustainable production, income, and food security. In Bangladesh, the Grameen Bank provides credit facilities to 40-50% of landless farmers, enabling them to acquire and raise livestock, essential for on-farm production. Livestock provides manure and organic fertilizer for crop production, home gardening, and fisheries, further increasing food security (Lemma, 2014) and reducing poverty.

Social entrepreneurs are key players in agricultural production, crop production, home gardening, fisheries, dairy, and livestock production (FAO, 2008; Plagányi, 2019). Farm diversification, which involves the cultivation of different crops, can increase food security, reduce the risk of crop failure, and promote sustainable production (Dey et al., 2005; McElwee & Robson, 2005). Furthermore, integrated farming, home gardening, community-based approaches, training, and technical support can help improve food security and reduce the risk of crop failure.

#### *2.3.4 Entrepreneurial ecosystems supporting farmers in developing countries.*

Access to finance is critical for small-scale farmers in developing countries, and entrepreneurs and microfinance institutions can facilitate access to credit and other financial services. Financial institutions are key players within entrepreneurial ecosystems. For instance, the International Food Policy Research Institute (IFPRI) report highlights the importance of microfinance institutions in enabling small-scale farmers to access credit and other financial services (International Food Policy Research Institute, 2004). Similarly, a study conducted in Mashhad City shows that access to credit and financial services can improve farmers' productivity and income (Saghaian, Mohammadi, & Mohammadi, 2022). Another study in Tanzania highlights how microfinance institutions have assisted small-scale farmers in accessing credit and other financial services, improving their farming practices and livelihoods (Girabi & Mwakaje, 2013). Additionally, entrepreneurs and microfinance institutions can help address the challenges small-scale farmers face in accessing credit, as shown in a study conducted in Karnataka, India (Elias, Ahmad, & Patil, 2015). Innovative financing approaches, such as cattle banking, can also aid farmers in opening bank accounts by using their cattle as collateral, motivating them to save their assets and encouraging asset accumulation among farmers in rural areas (Bote, Mago, & Hofisi, 2014). The above studies

underscore the critical role entrepreneurs and microfinance institutions can play in providing access to finance for small-scale farmers in developing countries.

Entrepreneurial ecosystems also offer market linkages, a critical factor in supporting small-scale farmers in developing countries and entrepreneurs play an essential role in facilitating these linkages. Taku-Forchu (2019) explores different approaches entrepreneurs and other organizations can take to facilitate market linkages between small-scale farmers and buyers. In examining market access, Shiferaw, Hellin, and Muricho (2011) discuss how smallholders and other organizations can help small-scale farmers access new markets through information and communication technologies (ICTs). Prahalad, Prahalad, Fruehauf, and Prahalad (2005) suggest entrepreneurs can develop business models that link small-scale farmers with new markets, focusing on low-income markets. Finally, Markelova and Mwangi (2010) examine how a market linkage program in rural Africa helped small-scale farmers increase their income and improve their food security.

Entrepreneurs can also introduce new technologies and innovations to farmers, which can help increase their productivity and yield, improving profitability and livelihoods. Kuhl (2020) discusses different approaches entrepreneurs and other organizations can take to transfer technology to small-scale farmers in developing countries like Honduras. Fitz-Koch, Nordqvist, Carter, and Hunter (2018) reviewed several studies demonstrating that agriculture offers a dynamic environment for researchers to explore the theory and practice of entrepreneurship. This is evidence that entrepreneurs can help small-scale farmers in developing countries by facilitating market linkages and introducing new technologies and innovations. This can increase farmers' income and improve their livelihoods.

Entrepreneurs can provide training and education to small-scale farmers in developing countries, which is critical for improving their business management and marketing skills and knowledge (Rahman & Bulbul, 2015). For example, the Food and Agriculture Organization (FAO) publication, "Entrepreneurship and Capacity Development in the Agricultural Sector," discusses how entrepreneurial ecosystems and organizations can develop capacity for farmers. Similarly, Liverpool-Tasie et al. (2020) investigate the role of entrepreneurship and capacity development programs in supporting small-scale farmers in developing countries.

Entrepreneurs can also advocate for policies that benefit small-scale farmers. For example, Birner and Resnick (2010) show how smallholder agriculture policies can achieve pro-poor growth by correcting market failures. Additionally, Khanal et al. (2020) highlight policy reviews supporting agribusiness development, including policies that benefit small-scale farmers. Onumah, Davis, Kleih, and Proctor (2007) discuss how entrepreneurs and other actors in value chains can advocate for policies that promote fair pricing and protect farmers from market abuses. Furthermore, Okeke and Nwankwo (2017) investigate the role of entrepreneurs in advocating for policies that support entrepreneurship and rural development.

The importance and critical role that entrepreneurs can play in supporting small-scale farmers in developing countries has been proven by several studies (Birner & Resnick, 2010; Onumah et al., 2007). They can provide training and education to farmers, facilitate market linkages, introduce new technologies and innovations, and advocate for policies that promote fair pricing and protect farmers from market abuses. By doing so, entrepreneurs can help to create an enabling environment for small-scale farmers to thrive and succeed, improving their productivity, profitability, and livelihoods.

#### *2.3.5 The importance of entrepreneurial ecosystems*

According to FAO (2015), the entrepreneurial ecosystem is directly related to social entrepreneurship and comprises various dimensions such as policy, finance, market, infrastructure, human capital, and culture. Al Mamun et al. (2011) demonstrated the significance of integrated agriculture and crop diversification to increase farmers' food security, which is interrelated to the entrepreneurial ecosystem. Maroufkhani et al. (2018) highlighted that developing a robust entrepreneurial ecosystem is crucial for promoting economic growth and development in developing countries. This ecosystem includes policies and regulations, access to funding, availability of talent and skills, and a supportive culture of entrepreneurship. Morris et al. (2020) emphasized the importance of utilizing local resources such as resource gifting, sharing, renting, co-marketing, and other collaborative efforts to support low-income entrepreneurs. They also suggested that entrepreneurs collaborate with the government to create a legal and regulatory framework that supports entrepreneurship and innovation, improves access to finance, provides mentorship and business training, and fosters a culture of entrepreneurship.

Finally, Tchamyou (2017) argued that a robust entrepreneurial ecosystem can reduce poverty and promote sustainable development in developing countries. Collaboration and networking between various actors in the entrepreneurial ecosystem, including entrepreneurs, investors, policymakers, universities, and other organizations, are also critical for creating a vibrant entrepreneurial ecosystem where new ideas can be shared, innovations can be developed, and businesses can grow and create jobs.

However, agricultural entrepreneurs, particularly in agri-cooperatives, face several challenges, such as institutional agreements, awareness, and information gaps (McElwee & Robson, 2005). These challenges arise due to political, social, economic, technical, and personal problems, leading to temporary and permanent barriers. This results in reduced development of agribusiness or agri-cooperatives, affecting sustainable production and income and leading to food insecurity (McElwee, 2006).

Social entrepreneurs, particularly women entrepreneurs, play a key role in sustainable production in agriculture-related fields such as crops, fisheries, dairy, and livestock production to support their husbands and existing family income (Fragouli & Xristofilaki, 2015). To increase sustainable income toward food security, entrepreneurial training in livestock/crop production, fisheries, and the manufacturing or processing of agricultural products is essential (Ahammad & Moudud-Ul-Huq, 2013). However, lacking training and experience impacts rural women entrepreneurs, making fruitful training and expertise crucial.

Agri-cooperatives and social entrepreneurs face challenges in agriculture, particularly in developing countries. Commercial entrepreneurs and non-profit organizations work towards agricultural production or non-farming activities such as training, agricultural manufacturing equipment, processing agricultural products, or supply chains. NGOs work directly or indirectly to organize cooperative education in society and work with entrepreneurs. Similarly, Association for Social Advancement (ASA), Thengamara Mohila Sabuj Sangha (TMSS), and Bangladesh Rural Advancement Committee (BRAC) provide training facilities for pre-cooperative or collaborative development under their supervision in Bangladesh. White, Quinney, and Jarvis (2016) highlighted that agri-entrepreneurs, commercial entrepreneurs, non-profit entrepreneurs, and women entrepreneurs face complex challenges for sustainable food production in agriculture or sub-sector agriculture such as fisheries,

dairy, and livestock. Many gaps exist between farmers and the entrepreneurial ecosystem, which requires effective policies and assistance for sustainable food production practices.

The bureaucratic procedure systems are a complicated and lengthy process that impedes private sector competitiveness. Habiba, Abedin, and Shaw (2015) emphasized that agri-cooperatives and social entrepreneurs need more access to management training, technical training, and specific assistance with market-related links related to sustainable food production and sustainable income towards food security.

In conclusion, social entrepreneurs, particularly women entrepreneurs, need sustainable production knowledge and expertise in agriculture to increase sustainable income towards food security. Entrepreneurial training in livestock/crop production, fisheries, and manufacturing or processing of agricultural products is necessary and available in urban areas but needs to be improved in rural areas. NGOs work towards organizing cooperative education and providing training facilities for pre-cooperative or collaborative development. The entrepreneurial ecosystem dimensions are related to policies, finance, market, infrastructure, human capital, and culture, and effective policies and assistance are needed for sustainable food production practices and income towards food security.

### *2.3.6 Food security in Bangladesh*

Bangladesh faces severe food security challenges due to its densely populated nature. According to Yearbook (2019), the country had a population of 163.04 million people, with a growth rate of 1.03%. Hossain et al. (2019) reports an annual population growth trend of 2 million, indicating a worsening food security situation. The country's food production has declined, leading to food shortages. The government has resorted to importing food from neighboring countries such as Thailand and Vietnam, with 6000,000 tons of grain (rice) imported in 2017 (Deb, Hossain, & Jones, 2009).

The Global Food Security Index assesses 113 countries and measures various drivers of food security, such as the population's dietary needs, the ability to supply enough calories to the population, and the impact of political instability, climate conditions, and conflicts (Ali, Alam, Molla, & Bokhtiar, 2019). Food security is a complex issue, and the index uses 28 unique indicators to evaluate the countries.

According to the Global Food Security Index 2019, Bangladesh has the lowest position among South Asian countries, ranking 83rd (GFSI, 2019). This index measures various indicators, including the quality and safety of food. Bangladesh received a score of 30.6 in this category. In contrast, Singapore is ranked among the top 10 countries in the index, with Ireland in second place, the USA in third place, and Switzerland in fourth place. Norway and Finland are jointly ranked fifth. In summary, Bangladesh faces significant food security challenges, reflected by its low ranking in the Global Food Security Index 2019. However, the government can address the declining food production and the growing population to ensure food security for its citizens.

Ghose, Razib, and Sharmistha (2014) highlight that Bangladesh faces a severe food crisis due to several challenges, including climate change, which impacts crop production, agriculture sub-sector, income, and distribution. Adverse weather effects, heavy rainfall, unexpected floods, droughts, and hot/humid weather due to climate change reduce crop yields and impact food security (FAO, 2008). The rapid growth of urbanization also reduces crop production and impacts food security (Muniruzzaman, 2013), while migration affects the dimension of food security (Hossain, Kazal, & Ahmed, 2013).

The concept of food security has four elements: availability, economic access, utilization, and stability, which are all impacted by climate change. However, farm-based social entrepreneurs also need to address other challenges, such as business syndicates, brokers/intermediaries, and market links (Muniruzzaman, 2013). In addition, food security, safety, nutritional value, and animal fodder are interconnected and crucial for human and animal health (Garcia, Osburn, & Jay-Russell, 2020).

Asaduzzaman et al. (2016) identified various challenges to food security, including complexity, which differs in developed and developing countries. Public and private integration is necessary to ensure economic access, availability, distribution, and stability. In order to achieve this, integration is required among farmers, traders, markets, and government agencies (Ghose et al., 2014). However, in Bangladesh, several gaps exist between private and public organizations, such as asymmetric information, inappropriate farm practices, business syndicates, illegal trading, fewer credit facilities, higher interest rates, and lack of agricultural inputs, services, security, and safety (Anik et al., 2012). Climate change also impacts domestic production, leading to food security challenges (Muniruzzaman, 2013).



This study focuses on the agriculture sub-sectors of crop production, milk, beef, food, and fodder related to farm-based social entrepreneurship, sustainable food production, and income for food security in Bangladesh. According to the Global Food Security Index 2021, Bangladesh has an overall score of 49.1 out of 100, ranking 84th out of 113 countries. The index shows affordability at 48.8, availability at 58.1, quality and safety at 45.5, and natural resources and resilience at 36.8 (GFSI, 2021). The Global Hunger Index 2021 reports that Bangladesh's score is 19.1, ranking 76th out of 116 qualifying countries. The index has shown a score of 19.1 (e.g.,  $\leq 9.9$  low;  $\geq 50.0$  extremely alarming). Bangladesh has an under-hunger index and severe hunger levels. Hunger, food insecurity, malnutrition, food production, trade of food, and food security are interconnected (GHI, 2021).

In rural and urban areas, food security issues are closely associated with health problems, including malnutrition and vitamin deficiencies, which can result in chronic health complications like type-2 diabetes, heart disease, and kidney failure. Hence, this study is aligned with several Sustainable Development Goals (SDGs): Goal 2 (zero hunger), Goal 8 (decent work and economic growth), and Goal 12 (sustainable consumption and production). As defined by the United Nations Development Programme (UNDP, 2021), these goals pertain to addressing food security concerns, promoting farm-based social entrepreneurship, and fostering sustainable food production and income in rural areas.

Islam et al. (2015) found significant gaps in the integrated farming system, such as the services of agriculture extension, lack of awareness on climate change, knowledge gap among farmers, limited fruitful training facilities, no farming insurance, financial barriers, limited credit access, and lack of services from government agencies, including the SME foundation of social entrepreneurship.

Farm-based social entrepreneurship is closely related to food production and has been linked to farmers and agribusiness ecosystems. Islam et al. (2015) have demonstrated the interdependence of sustainable food production and food security related to barriers to mixed cropping (such as agricultural input supply and market links) and integrated farming systems. Social entrepreneurship, sustainable food production, and food security are all interconnected and linked to agriculture extension services, credit facilities, and natural hazards in Bangladesh.

However, existing literature on food security issues reveals some knowledge gaps. Previous research on milk and beef production indicates that farm-based social entrepreneurs require effective policies and assistance to implement sustainable food production practices. Moreover, food security is closely linked to food production practices in agriculture sub-sectors such as milk and beef. This study shows that increasing milk and beef production can enhance food security at the individual and community levels in developing countries such as Bangladesh.

#### *2.3.6.1 Other food security challenges in Bangladesh*

In Bangladesh, farm-based social entrepreneurs and landless workers are in ecologically vulnerable situations due to the salinity-prone cropland and grassland area on the coastal side, worsened by climate change and natural disasters (Huq, 2015; Roy et al., 2019). These entrepreneurs require access to farmers' markets, agricultural services, and rural credit to purchase agricultural inputs for sustainable food production, irrigation, and post-harvest activities (DAE, 2006; Haider, Ahmed, & Mallick, 2011). The lack of access to credit facilities is a significant barrier to small-scale farming practices for Bangladesh's food security and socio-economic development (Rahman, 2017).

In addition to climate change, livestock farmers face disease incidence, poor genetic stock, and poor-quality feed, while entrepreneurs face limited mobility and lack of access to finance, market information, and agricultural inputs (Ghose et al., 2014; Roy et al., 2019). Credit access has been a significant barrier for women entrepreneurs, micro, small, and medium enterprises, and farmers in Bangladesh, with only 7% of small businesses having access to bank credit (Chowdhury & Alam, 2017). Furthermore, women entrepreneurs, especially in the agri-cooperative sector, need more access to affordable and appropriate financial packages with insurance facilities, hindering their contributions to sustainable food production and security (Chowdhury & Alam, 2017). In summary, addressing the challenges faced by farm-based social entrepreneurs, landless workers, and women entrepreneurs is crucial for sustainable food production and food security in Bangladesh, especially given the country's vulnerability to climate change and natural disasters.

### 2.3.6.2 Farming in Bangladesh

Five farmer categories manage farms in Bangladesh and largely dependent on farm size.

Table 2.7 provides a list of farmer categories based on their farm size and the percentage of households, and the operating area they represent.

**Table 2.7 List of farmers categories**

S/N	Category of Farmers	Farm Size	% of Household	% of Operating Area
1	Landless Farmers	0 to 0.49 acres of land	52.65%	4.50%
2	Marginal Farmers	0.50 to 1.49 acres of land	23.53%	18.50%
3	Small Farmers	1.50 to 2.49 acres of land	10.53%	18.20%
4	Medium Farmers	2.50 to 7.49 acres of land	11.65%	42.40%
5	Commercial Farmers	7.50 acres of land or over	1.67%	16.40%

*Source: DAE, 2017<sup>1</sup>*

Table 2.7 provides an overview of the different categories of farmers, farm sizes, percentage of households, and percentage of the land operating area that identifies the characteristics of farms and farmers/entrepreneurs in Bangladesh (FAO, 2017). The conventional method of agriculture is still prevalent in rural areas of Bangladesh, but the sustainability of agriculture is threatened by issues such as land degradation, deforestation, and biological matter. In addition, climate change, land erosion, salinity, lack of irrigation systems, increasing urbanization, and migration of people are also contributing factors to declining crop yields (FAO, 2017).

Due to a lack of knowledge and cultural factors, agrochemicals have become common in rural agriculture. However, this is only sustainable in the short run. In achieving sustainable food production, new ideas for food security goals can be developed in Bangladesh (Rasul & Thapa, 2003). Furthermore, in a fragile environment where 82% of the population depends on agriculture and related sub-sectors for their livelihood, it is crucial to develop sustainable agriculture practices (FAO, 2017).

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<sup>1</sup> Note. From “Strategic Plan,” by DAE, 2017, *Department of Agriculture Extension* by DAE. [http://dae.portal.gov.bd/sites/default/files/files/dae.portal.gov.bd/page/a0c9fd4d\\_d704\\_4bb0\\_9a66\\_c2fb6a1767e5/SP2002-2006\\_part2.pdf](http://dae.portal.gov.bd/sites/default/files/files/dae.portal.gov.bd/page/a0c9fd4d_d704_4bb0_9a66_c2fb6a1767e5/SP2002-2006_part2.pdf).

The average holding land ratio in Bangladesh is 0.09 hectares per head. However, cropland has been reduced by 2% due to roads, industries, settlements, and non-agricultural purposes. Soil health and fertility are declining due to chemical fertilizers, pesticides, mono-cropping, and intensive land utilization. Approximately 65% of the agricultural area is under unhealthy soil, and soil fertility is decreasing. Organic matter is also lacking in cultivable areas, which is a significant cause for using more chemical fertilizers and other input materials for small farmers to grow products and meet food security requirements (Rasul & Thapa, 2003).

The use of chemical fertilizers and pesticides has a detrimental effect on human health, livestock, and aquatic life. In addition, arsenic contamination in groundwater is a significant problem. As a result, soil fertility and health are imbalanced, which reduces crop yields and affects small farmers with insufficient financial resources to purchase necessary agricultural inputs and improved technologies (Muneer, 1989).

Small herds of low-producing dairy cows characterize small dairy farms in Bangladesh. Family labor manages these cows due to capital constraints and input materials for dairy farming. These small farmers do not receive any subsidization support from the government, and their sustainability factors depend on socioeconomic conditions and physical work (Chand, Sirohi, & Sirohi, 2015).

### *2.3.6.3 Relevant statistics*

The Bangladesh Bureau of Statistics (BBS, 2016) provides essential insights into the economic landscape by comparing monthly household income and expenditure between 2016 and 2010. Notably, the national household income rose significantly from Taka 11,479 in 2010 to Taka 15,945 in 2016, accompanied by an increase in monthly household expenditure from Taka 11,200 to Taka 15,715 over the same period. Further breakdowns reveal disparities between rural and urban areas, with average monthly incomes of Taka 13,353 and Taka 22,565 in 2016, respectively. The period from 2010 to 2016 witnessed a growth of 38.90% in national household income, with rural and urban areas experiencing increases of 38.40% and 36.96%, respectively. Correspondingly, monthly household consumption levels surged by 38.51% nationally, with rural and urban areas recording increases of 46.97% and 26.89%, respectively. Spending patterns varied, with rural residents allocating more to food, while urban dwellers devoted a significant portion to non-food expenditures (57.41%). Specific expense categories, such as clothing, footwear, house rent, and mobile phone expenditures, underwent notable changes. Migration trends within the nation and abroad also

shifted, and remittances from family members abroad played a significant role in sustaining income and meeting household expenses. Table 2.8 presents detailed data on migration, remittance inflow, and household expenditure on basic needs, investment, durable goods, and savings for rural and urban areas.

**Table 2. 8 Migration and remittance inflow**

S/ N	Migration	Year 2010	Year 2016	Household Exp. on Basic Needs	Investment	Durable goods	Savings
1	Rural	8.60%	11.22%	68.44%	27.98%	2.13%	1.45%
2	Urban	8.27%	12.60%	76.48%	18.48%	2.35%	2.70%

*Source: BBS, 2016<sup>2</sup>*

According to a 2018 country profile, Bangladesh ranks seventh globally among the top recipients of remittances. Table 2.9 illustrates remittance outflow data for 2018-2019, highlighting the significant contribution of wage earners' remittances to Bangladesh's gross domestic product. Remittance volumes from different countries, including Saudi Arabia, the United Arab Emirates, the UK, Canada, the USA, and the Gulf Region, are outlined alongside the migration percentage and total remittance outflow (Country Profile, 2018).

**Table 2. 9 Remittance outflow**

S/ N	Migration	Remittance volumes received in 2018-2019	The total remittance outflow in 2018-2019
1	Saudi Arabia	18.9%	16.4 billion
2	United Arab Emirates	21.2%	
3	UK	14.5%	
4	Canada	28.4%	
5	USA	19%	
6	Gulf Region	26.2%	

*Source: Country Profile, 2018<sup>3</sup>*

The Bangladesh Bureau of Statistics (BBS, 2016) underscores the substantial relationship between food security and household welfare. This study reveals gaps in sustainable food

<sup>2</sup> Note. From "Bangladesh Population and Housing Census," by BBS, 2016, *Bangladesh Bureau of Statistics* by BBS. (<http://www.bbs.gov.bd>)

<sup>3</sup> Note. From "Country Profile", 2018, *World Bank-Bangladesh*, (<https://data.worldbank.org/country/BD>)

production and security that significantly impact household welfare indicators. Household welfare indicators are intricately linked to farm-based entrepreneurs, such as farmers, who face ongoing challenges due to unmet household demands. For example, financial constraints may arise for farmers engaged in mixed cropping or integrated farming systems, necessitating more information, sustainable production practices, and government agency services to generate sustainable income and support household food security in Bangladesh. Gillespie and Kadiyala (2012) emphasize the vital role of agriculture as a source of food and income for producer households, reinforcing the interconnectedness of food security, household welfare, and various influencing factors such as income, education, health expenses, and household consumption.

#### *2.3.6.4 The Challenges of the COVID-19 Pandemic in Bangladesh*

The COVID-19 pandemic has presented formidable challenges for Bangladesh, exacerbating social inequalities and deepening poverty, particularly among marginalized groups (World Health Organization, 2022). This crisis has laid bare weaknesses in the healthcare system, economic struggles, and governance issues, underscoring the critical need to strengthen oversight institutions and promote inclusive governance. The pandemic's impact on Bangladesh's progress towards the 2030 Agenda is evident, with disproportionate effects on economic, social, and environmentally Sustainable Development Goal (SDG) pillars (Bhattacharya, Khan, & Khan, 2022). The study highlights intensified vulnerabilities and emphasizes the necessity for urgent data-driven policy interventions to address persistent challenges among disadvantaged groups.

Despite COVID-19 inducing positive environmental changes through reduced pollution, it presented challenges with increased medical waste. Bangladesh grappled with economic, social, and health crises, affecting sectors such as education and agriculture. Effective government measures and collaboration with pharmaceutical industries are vital for ongoing management (Gautam et al., 2022). In the broader Asia-Pacific region, converging crises have led to economic turmoil, impacting food, energy, and macroeconomics, exacerbating poverty, and hindering SDGs. Urgent actions are imperative to strengthen resilience and achieve SDG targets for hunger and sustainable energy (ESCAP, 2023).

The challenges in Bangladesh are multifaceted, profoundly impacting the societal and economic landscape. The healthcare system, strained by a surge in patients, requires

additional resources, including stretched hospital capacities and a scarcity of medical equipment and skilled professionals (World Health Organization, 2022). The rapid spread of the virus, compounded by high population density and suboptimal hygiene practices, hampers containment efforts. Economically, vital sectors such as textiles and garments suffer disruptions due to global supply chain disturbances, resulting in factory closures, job losses, and reduced incomes. Informal workers, constituting a significant portion of the workforce, face heightened vulnerability without social safety nets (World Bank, 2022).

Educational institutions' closure exacerbates societal inequalities, causing disruptions in learning, particularly for vulnerable students facing a digital divide. The pandemic's toll on mental health includes induced fear, anxiety, and isolation, with misinformation contributing to vaccine hesitancy (The Daily Star, 2022). Addressing these challenges requires a comprehensive approach involving bolstered healthcare, financial support, equitable education access, and combating misinformation. Notably, the pandemic underscores the importance of addressing food security, social entrepreneurship, and entrepreneurial ecosystems. Disruptions in global food supply chains raise concerns about availability and affordability, with social entrepreneurship offering innovative solutions to ensure access to nutritious food and support local farmers (UNDP-Bangladesh, 2022). Social entrepreneurs have played a pivotal role in meeting societal needs during the pandemic, highlighting their importance in providing essential goods, services, and support systems (SSIR, 2023).

In conclusion, the pandemic accentuates the imperative to address food security, harness the potential of social entrepreneurship, and cultivate robust entrepreneurial ecosystems for a sustainable and inclusive recovery, fortifying resilience against future crises.

#### *2.3.6.5 Where does the responsibility for feeding our future lie?*

The responsibility for securing our future food supply is a shared endeavour encompassing individuals, governments, businesses, and the global community. Individuals play a pivotal role by making mindful and sustainable food choices to minimize waste (Some et al., 2022). Governments are responsible for implementing policies that bolster sustainable agriculture, ensure food safety, and address food security issues (Farooq et al., 2019). Corporations must adopt ethical food production and distribution practices, emphasizing transparency and environmentally conscious approaches (Murrell et al., 2022). Global cooperation is paramount to addressing challenges in the food distribution trade and mitigating the impact of

climate change on agriculture (UNFAO, 2022). Investment in research and technology is essential to enhance agricultural efficiency and devise innovative solutions to global food challenges (FAO, 2021). Educational and awareness programs empower individuals to make informed food choices and advocate for positive change (WHO, 2018). Additionally, efforts must address social and economic inequalities to ensure fair access to food resources (Oxfam, 2020). In summary, a holistic and collaborative approach is imperative to construct sustainable and equitable food systems for the future.

#### *2.3.6.6 How can we increase multi-level awareness of the scale in addressing global food security?*

A comprehensive strategy is essential to enhance awareness of global food security challenges. Firstly, educational initiatives must be prioritized to enlighten individuals about the intricacies and hurdles associated with food security (Some et al., 2022). Governments play a crucial role by formulating policies that underscore and communicate the significance of food security at both national and international levels (Farooq et al., 2019). Collaborative endeavours involving governments, non-governmental organizations, and international agencies are imperative for disseminating information and coordinating strategies on a global scale (UNFAO, 2022). Using digital and social media platforms is pivotal in augmenting public awareness, facilitating information sharing, and fostering global community engagement (Xiong, 2021). Furthermore, forging partnerships with the private sector can leverage their resources and influence to amplify messages emphasizing the urgency and importance of addressing food security (FAO, 2021). By adopting an integrated approach that spans from individual awareness to international collaboration, a more effective and widespread comprehension of the vast scale of the food security challenge can be attained.

## **2.4 Chapter summary**

In this chapter, the multifaceted concept of food security takes centre stage, encompassing physical, social, and economic access to sufficient, safe, and nutritious food. Exploring food security encompasses key elements such as availability, access, utilization, and stability, focusing on Bangladesh as a case study.

The discussion extends to sustainable food production, shedding light on disparities between developed and developing nations regarding food insufficiency and nutrition-related issues. Integrating food safety, health, nutrition, trade, poverty, and development is crucial for



achieving comprehensive food security. Sustainable production is defined as an economically viable, safe, and healthy process benefiting workers, communities, and consumers, with a consideration of social, economic, and environmental goals.

Various sources of sustainable food production, including fair trade, sustainable intensification, and integrated farming systems, are explored. The chapter outlines challenges such as soil degradation, climate change, and crop failure that impact sustainable production. Social entrepreneurship emerges as a global phenomenon addressing societal issues, defined as mission-driven businesses fostering economic activities through micro, small, and medium entrepreneurship. Social entrepreneurship, recognized globally, acts as a catalyst for societal change, although the need for a unified definition or theoretical framework poses challenges.

The entrepreneurial ecosystem, crucial for economic development, encompasses government policy, funding, regulatory framework, culture, mentors, and support systems. Collaboration and networking within this ecosystem contribute to vibrant entrepreneurship, with social entrepreneurship playing a pivotal role in enhancing agricultural productivity and economic growth, thereby reducing poverty, and increasing food security.

The study shifts focus to Bangladesh, outlining challenges hindering food security, including a growing population, climate change, floods, limited access to credit, and agricultural inputs. Issues specific to the dairy and beef production sectors, including market access and policy implications, are detailed. The impact of climate change on livestock production and the consequential effects on food security are explored, with data indicating deficiencies in milk production and a small surplus in meat production. Notably, the data for 2021-2022 shows a decrease in milk deficiency, confirming a positive trend in addressing household food insecurity. The chapter underscores the importance of effective policies and assistance for sustainable food production and income in addressing these challenges.

The narrative expands to examine how COVID-19 exacerbates social inequalities and poverty in Bangladesh, emphasizing weaknesses in healthcare, economic disruptions, and governance issues. The pandemic's disproportionate impact on Sustainable Development Goals necessitates comprehensive approaches, including enhanced healthcare, financial support, equitable education, and combating misinformation. Social entrepreneurship is

crucial in addressing food security, calling for collaboration among individuals, governments, businesses, and the global community.

The chapter concludes with a strategy for increasing awareness of global food security challenges through education, government policies, global cooperation, digital media, and private-sector partnerships. In conclusion, the chapter underscores the urgent requirement for a comprehensive and collaborative approach to address the challenges arising from the pandemic and the global food security crisis. This emphasizes the need for coordinated efforts and holistic strategies to tackle complex issues effectively.

## **CHAPTER THREE**

### **CONCEPTUAL FRAMEWORK**

This chapter presents the conceptual framework that provides a theoretical structure guiding the study (Creswell & Creswell, 2017). The framework includes concepts, definitions, and the relationships between them and incorporates propositions about the phenomenon being studied (Patton, 2014). The propositions guide the data collection and analysis process and help the researcher develop a deeper understanding of the phenomenon. The conceptual framework plays a critical role in making sense of the data collected during the study.

#### **3.1 Introduction**

The focus of this study is food security, and a conceptual framework highlights the interconnected components of an entrepreneurial ecosystem that contribute to food security, particularly farm-based social entrepreneurship, sustainable food production, and income. In addition, the framework emphasizes the critical role of farm-based social entrepreneurs as drivers of change within the ecosystem. Various stakeholders, including investors, government agencies, research institutions, and NGOs, provide resources such as funding, technical expertise, and policy support that enable and sustain entrepreneurial activities in the agriculture sector (Isenberg, 2011; Mason & Brown, 2014; Stam & Spigel, 2016; Stam & van de Ven, 2019).

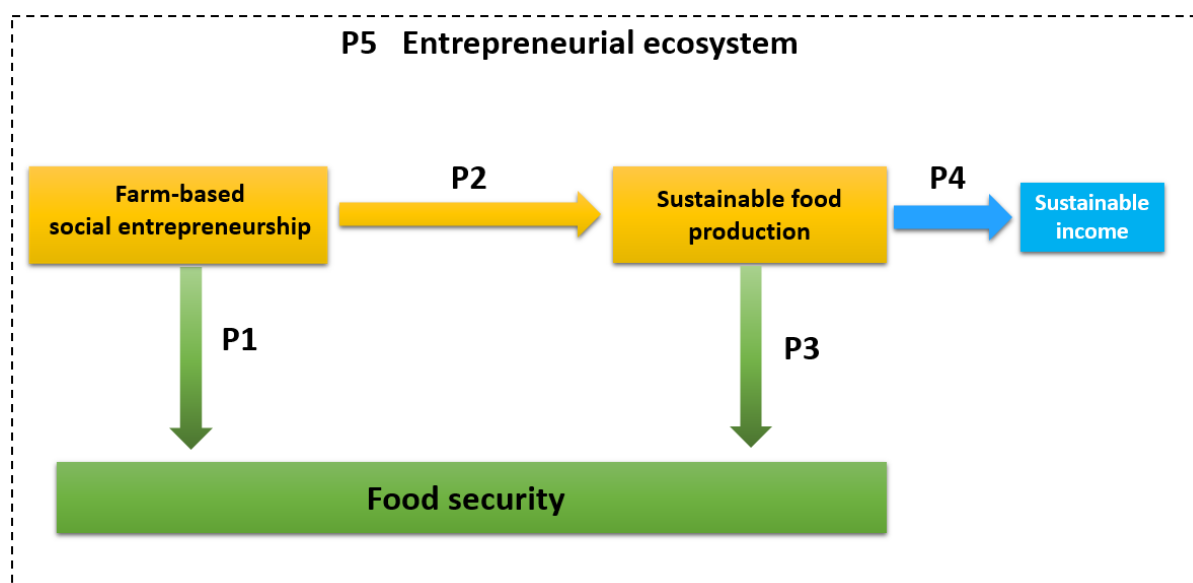
Sustainable food production ensures safe and nutritious food availability while minimizing adverse environmental impact. Sustainable farming practices can enhance soil health, conserve water resources, and reduce greenhouse gas emissions (FAO, 2019; Rockström et al., 2017; Lal, 2016; Smith et al., 2014; Foley et al., 2011; Godfray et al., 2010).

Farm-based social entrepreneurship involves innovative business models that combine agricultural production with social and environmental goals. These enterprises create opportunities for small-scale farmers to increase their income while addressing social issues such as poverty, gender inequality, and food insecurity (García-Jurado, Pérez-Barea, & Nova 2021; Klerkx, Aarts, & Leeuwis, 2010).

Sustainable income from farm-based social entrepreneurship can improve individual, community, and national food security. By generating income, these enterprises enable

farmers to purchase food and other necessities while contributing to the local economy. Moreover, these enterprises can enhance their communities' food security by producing nutritious and affordable food (Moudr, 2018; Ojha, 2021; Titttonell, 2014).

Finally, the conceptual framework emphasizes the importance of an entrepreneurial ecosystem that fosters sustainable food production, income generation, and farm-based social entrepreneurship, as it is critical in promoting food security in Bangladesh. The framework illustrated in Figure 3.1 is based on a comprehensive literature review and presents several propositions that illustrate the linkages among key constructs related to the study.



**Figure 3.1 Conceptual framework**

The conceptual framework illustrates an entrepreneurial ecosystem supporting sustainable food production, income, and security. It depicts the interconnectedness of farm-based social entrepreneurship within the realms of sustainable food production, income generation, and food security. The dotted line box represents the entrepreneurial ecosystem, which is critical for supporting the growth and development of farm-based social entrepreneurship. These framework elements are related to the United Nations Sustainable Development Goals (UN SDGs) (UNDP, 2015). The SDGs, such as decent work and economic growth (SDG 8), sustainable consumption and production (SDG 12), and zero hunger (SDG 2) (UNDP, 2021), provide a framework for measuring progress towards sustainable development. Additionally, the framework highlights the importance of an integrated approach to promoting sustainable food production, income, and food security within a supportive entrepreneurial ecosystem.

The proposition-based approach helps to explain the complex relationships between key constructs and provides a basis for future research and policy development.

#### *Substantial Relationship with Micro, Meso, and Macro Levels*

This study scrutinizes the nuances of farm-based social entrepreneurship at the micro level, emphasizing its pivotal role in sustainable food production and income generation.

Simultaneously, the meso level recognizes the significance of the entrepreneurial ecosystem in supporting the growth of farm-based social entrepreneurship. As illustrated in the framework, this ecosystem serves as a crucial link, facilitating connections between sustainable food production, income, and food security. At the macro level, the study advocates for an integrated approach to promote sustainable food production, income, and food security within the broader context of a supportive entrepreneurial ecosystem. The proposition-based approach in the conceptual framework unravels complex relationships between these key constructs, offering a foundation for future research and policy development.

### **3.2 Farm-based social entrepreneurship and food security**

Manganhele (2010) argues that the inaccessibility of agricultural credit is one of the factors affecting commercial farmers (entrepreneurs) who depend on rainfall alone and cannot access irrigation systems or other technological advantages. Zahra, Anwar, Hassan, & Mehmood (2013) further argue that institutional credit and agricultural inputs are positively correlated, and productivity depends on irrigation systems, which statistically impact sustainable production. Therefore, institutional credit positively affects production in rural areas. Alauddin and Tisdell (1986) also argue that large farmers (entrepreneurs) in rural areas own irrigation equipment and provide rental packages and sell irrigation water to small farmers.

For social entrepreneurs, there is evidence that irrigation credit is an essential input for agriculture in the dry season in Bangladesh to increase crop production and provide feed and fodder for livestock. Rice, potatoes, vegetables, feed, and forage require frequent irrigation in the dry season due to less rainfall, and farmers use ground and surface water for irrigation, leading to food security. However, groundwater is reserved only for drinking in Bangladesh (Rahman, 1998).

Therefore, social entrepreneurship is essential in promoting food security in areas where access to credit, irrigation, and other resources is limited or insufficient. By working towards agricultural production or non-farming activities such as manufacturing equipment for agriculture, processing agricultural products, or improving supply chains, social entrepreneurs can create sustainable income and promote sustainable food production, leading to greater chances of success (Manganhele, 2010; Rahman, 1998; Zahra et al., 2013).

Social entrepreneurs also enhance food security by developing innovative solutions to address issues such as food waste, distribution, and accessibility. Furthermore, by leveraging their entrepreneurial skills, they can create new business models and partnerships that increase the efficiency and effectiveness of food systems, prioritizing social and environmental impact alongside financial success. Examples of social entrepreneurship in agriculture and food systems include farm-based social entrepreneurship, food recovery and redistribution initiatives, and community-supported agriculture programs (Kankwamba & Kornher, 2019). Therefore:

***Proposition 1: Farm-based social entrepreneurs enhance food security by developing innovative solutions to address issues in food system in Bangladesh.***

### **3.3 Farm-based social entrepreneurship and sustainable food production**

Farm-based social entrepreneurship is a concept that involves using sustainable farming practices to create social and economic benefits for communities. It is a model that supports small-scale farmers, promotes local food production, and reduces the environmental impact of farming activities (Moudr, 2018; Thompson & Doherty, 2006). The role of farm-based social entrepreneurs is vital in promoting sustainable food production. They bring innovative ideas to the agriculture sector, introducing new technologies, products, and services that support sustainable practices. In addition, they create new markets for locally grown food, connecting consumers with fresh and healthy produce (Moudr, 2018). Farm-based social entrepreneurs also help to build resilient communities by fostering social and economic connections between farmers, consumers, and local businesses. As a result, they create jobs, promote community development, and contribute to the local economy (Apostolopoulos, Newbery, & Gkartzios, 2019).

Moreover, farm-based social entrepreneurship supports the United Nations' Sustainable Development Goals (SDGs) by addressing food security, poverty, and environmental sustainability. By promoting sustainable farming practices, farm-based social entrepreneurs contribute to reducing greenhouse gas emissions, conserving biodiversity, and promoting soil health (Foley et al., 2011; UNICEF, 2021). Farm-based social entrepreneurship is a crucial model supporting sustainable food production and creating social and economic benefits for communities. It is an innovative approach to agriculture that brings together economic, environmental, and social goals to promote sustainable development (Sargani, Zhou, Raza, & Wei, 2020). Therefore:

***Proposition 2:** Farm-based social entrepreneurship is likely to enhance sustainable food production and hence promote food security in Bangladesh.*

### **3.4 Food security and sustainable food production**

Food security is heavily reliant on sustainable food production, and farmers, as social entrepreneurs, play a vital role in achieving this goal. According to Godfray et al. (2010), farmers require technical knowledge, skills, and significant finance to achieve sustainable food production, which includes soil preparation, maintenance, machinery, irrigation, and livestock varieties that maximize yields. Creating knowledge ecosystems is essential for social entrepreneurs to diversify and enhance production (Scaringella, L., & Radziwon, 2018).

While sustainable crop production and fisheries, as well as milk and beef production, can increase the chances of success and promote food security at individual, community, and national levels in Bangladesh, there are various risks, such as climate change, drought, and floods that make sustainable food production challenging (Correspondent, 2018, 2019; Mondal, 2010). Therefore, Bangladesh is vulnerable to food insecurity (Roy et al., 2019).

Integrating milk and beef into small-scale farming practices can increase farm diversification and food production, promoting sustainable food production and security (Lemma, 2014). Livestock-based enterprises are crucial for many small-scale farmers, especially in Africa, where they help reduce poverty and increase sustainable production and income (Dixon, Gibbon, & Gulliver, 2001). For example, in Bangladesh, the Grameen Bank provides credit facilities to landless farmers (entrepreneurs) to acquire and raise dairy cows (Yunus, 2009).

Farm-based social entrepreneurs with sustainable milk and beef production, value chain, and cooperative functions can increase the probability of sustainable milk and beef production (Kuhl, 2020) and promote food security in Bangladesh. Hence:

***Proposition 3:*** *Food security is influenced by sustainable food production by milk and beef farmers in Bangladesh.*

### **3.5 Sustainable food production and sustainable income for farm-based social entrepreneurs**

Sustainable income from farming is essential to support the livelihoods of farmers and their families. Fragouli and Xristofilaki (2015) argued that women entrepreneurs are increasingly interested in pursuing agricultural-related businesses, such as livestock farming, home gardening, horticulture, and fisheries, to supplement their family income. Therefore, it is necessary to provide entrepreneurial training in livestock and crop production, mixed farming, fishing, and agricultural processing to ensure sustainable food production and earnings for farm-based social entrepreneurs (Ahammad & Moudud-Ul-Huq, 2013). For instance, a successful training program in Vietnam called "Start Your Business" primarily caters to women entrepreneurs seeking to start small businesses that can generate additional income to support their families. Sustainable food production is indirectly promoted by providing such training opportunities, thus contributing to overall food security (Ayadurai & Sohail, 2006; Barwa, 2003).

Furthermore, women entrepreneurs can contribute significantly to sustainable food production by managing family businesses and engaging in various on-farm and off-farm activities (Aramand, 2012). Their involvement in activities like poultry farming, dairy farming, and vegetable shops increases their household income and contributes to food security by providing access to nutritious food. However, women entrepreneurs need more access to capital, training, and markets, which hinder their ability to invest in sustainable food production (Ahammad & Moudud-Ul-Huq, 2013).

When farmers engage in mixed cropping and diversify their income sources, they are more likely to achieve sustainable income, which can promote sustainable food production (Kabir & Huo, 2011). In addition, women entrepreneurs can play a critical role in managing family businesses in day-to-day operations, engaging in off-farm and on-farm activities, buying, and



selling livestock and feed, and operating small businesses such as grocery and vegetable shops, all of which can increase sustainable income towards food security (Aramand, 2012). Additionally, sustainable income for social entrepreneurs may sometimes come from something other than food production but from related activities such as processing, marketing, or value-added services (Chambers, 2017).

Mixed cropping helps maintain soil fertility, reduces the risks of crop failure, and increases income through a diversified range of crops (Kabir & Huo, 2011). Furthermore, farmers can achieve sustainable income and promote sustainable food production by diversifying income sources through activities like agroforestry, beekeeping, and ecotourism. This is because sustainable income allows farmers to invest in the necessary inputs like seeds, fertilizers, and irrigation systems, which can increase crop yields and productivity (Kabir et al., 2012).

Sustainable income for social entrepreneurs can also contribute to sustainable food production by promoting related activities such as food processing and marketing. These activities can add value to agricultural products and increase their shelf life, making them more accessible and affordable to consumers (Chambers, 2017). Social entrepreneurs can also be vital in promoting sustainable farming practices and building resilient food systems.

When farmers engage in activities that provide them with a sustainable income, such as social entrepreneurship, social enterprises, and value-added services such as food processing and transportation, they are more likely to have the resources and stability to invest in sustainable food production (Dzingirai, 2021; Mswaka et al. 2016; Chambers, 2017). Moreover, sustainable income can enable farmers to purchase necessary resources, such as seeds and fertilizers, to increase their crop yields and productivity, thereby contributing to food security (DAE, 2006; Rasul & Thapa, 2003). Additionally, income generated from non-agricultural activities, such as petty trading, can provide access to a more diversified range of food options for rural households, especially during food scarcity (McDonald et al., 2015; Rasul & Thapa, 2003). While sustainable income alone may not ensure food security, it can play a critical role in enhancing the capacity of farmers to produce food sustainably and contribute to food security (Kabir et al., 2012). Therefore, diversifying income sources and promoting sustainable income can enhance food production, improve access to nutritious food, and contribute to food security. Hence:

***Proposition 4:*** Sustainable food production is likely to promote sustainable income for farm-based social entrepreneurs through diversification and hence, enhance food security in Bangladesh.

### **3.6 Social entrepreneurs and local entrepreneurial ecosystem**

Stuart and Sorensen (2007) argue that entrepreneurs require social networks to access business associations, early customers, and former employees in their local area. They also need resources and support to sustain their social venture. Evidence shows that entrepreneurs require business incubation services, financial information, network access, business premises, necessary information, and advice (Miller & Bound, 2011). Additionally, Miller and Bound (2011) demonstrate that networks, suppliers, products, and markets play a role in entrepreneurial ecosystems if intensive support and network connections for entrepreneurship are components of resource funding, mentoring, and government support. Entrepreneurs require marketing channels, engagement of localized learning, product and market knowledge, the structure of entrepreneurship, strategies, and technical skills in the start-up stage of entrepreneurial ecosystem formation (Roper & Hart, 2013). Stuart and Sorensen (2007) argue that entrepreneurs require social networks and resources to sustain their social ventures. Networks, suppliers, products, and markets play a role in entrepreneurial ecosystems (Miller & Bound, 2011).

The socioeconomic context is related to entrepreneurial ecosystems and focuses on providing resources to entrepreneurs (Mason, 2009; Murray, 2007). Local entrepreneurial ecosystems support social entrepreneurs and shape government policies and the small business environment by bringing together regulatory authorities, financial providers, venture groups, business angels, banks, microfinance, public capital markets, and service providers (Lerner, 2010). Hence, local entrepreneurial ecosystems can significantly shape government policies and support systems for the small business environment (Birner & Resnick, 2010; Onumah et al., 2007). The propositions highlight the importance of a supportive entrepreneurial ecosystem in promoting sustainable food production and security through farm-based social entrepreneurship. Therefore:

***Proposition 5:*** Supportive local entrepreneurial ecosystems in Bangladesh are likely to help social entrepreneurs to succeed in enhancing food security.

### **3.7 Chapter summary**

This chapter presents the conceptual framework for the study on food security, which focuses on the interrelated components of an entrepreneurial ecosystem that contribute to food security, including farm-based social entrepreneurship, sustainable food production, and income generation. The framework highlights the pivotal role of farm-based social entrepreneurs as drivers of change within the ecosystem and underscores the importance of an entrepreneurial ecosystem that fosters sustainable food production, income generation, and farm-based social entrepreneurship. The framework is based on a comprehensive literature review on which five propositions were developed and demonstrate the linkages among key constructs of this study. The chapter emphasizes the interrelationship between food security, sustainable food production, and social entrepreneurship. It posits that sustainable food production is vital to achieving food security and that farmers, as social entrepreneurs, can play a critical role in this regard. Milk and beef production can promote sustainable food production in rural areas, and sustainable milk and beef production can contribute to food security. Social entrepreneurship is necessary to promote food security in areas lacking credit, irrigation, and other resources. Moreover, farm-based social entrepreneurship is essential for promoting sustainable food production and creating social and economic benefits for communities. The propositions derived from the framework provide a basis for data collection, analysis, and policy development, contributing valuable insights into addressing food security challenges in Bangladesh.

## **CHAPTER FOUR**

### **RESEARCH METHODOLOGY**

#### **4.1 Introduction**

This chapter provides a thorough overview of the methodology employed in this study, encompassing the overall research approach and techniques. It details the process of selecting research questions, data collection methods, data analysis techniques, and the interpretation of findings. The methodology was meticulously designed to ensure an effective and accurate response to the research question, presented with clarity and transparency to facilitate replication and a thorough examination of the findings.

The study adopts a deductive approach, utilizing a qualitative methodology outlined by Kabir (2016). Qualitative research is particularly suited for addressing "how" and "why" research questions related to research problems, objectives, and gaps. Widely applied in the social sciences, this approach allows for exploring social interactions, systems, and processes, offering a comprehensive understanding of individuals' perceptions, actions, and the management of their daily lives in a manner that is easily comprehensible for participants (Kabir, 2016).

Given the research setting and the specific regions under investigation – Gaibandha and Bogra districts in the north and Bhola district in the south of Bangladesh – a qualitative approach is deemed appropriate for data collection, organization, evaluation, and analysis. The study employs semi-structured interviews as the primary method for data collection, facilitating a rich exploration of the research topic: the role of social entrepreneurs in food security in Bangladesh.

In addressing the contextual idiosyncrasies at work, the study aims to provide a nuanced understanding of the intricate factors influencing social entrepreneurship's role in ensuring food security. This qualitative approach allows for an in-depth exploration of the social, economic, and cultural nuances that contribute to the effectiveness of social entrepreneurial initiatives in these regions of Bangladesh.

## **4.2 Ontology**

An entrepreneurial ecosystem is a phenomenon closely aligned with the social sciences (Duberley, Johnson & Cassell, 2012). The ontological perspective of this phenomenon is rooted in the relativist assumption (Duberley, Johnson & Cassell, 2012). This study seeks to capture diverse perspectives and the subjective meanings of individuals, attributes, and their experiences. Within an ecosystem framework, ontology acknowledges the constant state of change, which occurs across varying levels of complexity. In the context of biological aspects, ontology suggests that understanding the dynamics and evolution of ecosystems requires consideration of three key factors: external, actor cooperation, and the focus on relationships between actors (Freeman & Audia, 2006).

Ontological viewpoints contribute to the ongoing debates surrounding entrepreneurship's economic challenges, highlighting the tension between constant change and financial stability (Audretsch & Belitski, 2017). The approach to understanding an entrepreneurial ecosystem emphasizes the collaborative efforts of entrepreneurs within a community, focusing on the interplay among social, cultural, political, and economic components (Spigel, 2017). Consequently, the ontological stance embraced in this study aligns with constructivism, which contrasts objectivism. Specifically, the study adopts a subjectivist ontology, recognizing the subjective nature of individuals' experiences and perspectives.

## **4.3 Epistemology**

From a social constructionist perspective, this study adopts an epistemological viewpoint that explores how knowledge is constructed. Social entrepreneurs and entrepreneurial investors engage in sense-making processes shaped by the context of the entrepreneurial ecosystem (Karim et al., 2018). The study's conceptual framework highlights novel ideas, the influential factors at play, and the critical elements of the ecosystem (Karim et al., 2018). According to the social constructionist standpoint, people construct meanings and outcomes collaboratively through an ongoing series of events. Entrepreneurship is thus seen as intricately connected to past, present, and future events (Dimov, 2020; Sundin & Tillmar, 2008; Fletcher, 2006; Clarysse & Moray, 2004).

Epistemology pertains to the principles and guidelines that underpin knowledge formation. Within epistemology, two dimensions are commonly discussed: social constructivism and positivism (Duberley, Johnson, & Cassell, 2012). This study embraces a social

constructionist epistemology, emphasizing the understanding of social reality and placing significance on people's experiences. Social constructionism recognizes that knowledge is constructed through the interaction and interpretation of individuals and groups. The constructivist research paradigm offers strengths that enable the exploration of human thoughts, emotions, and experiences, facilitating the development of new ideas and theories (Taran, 2019).

Selecting a paradigm and methodological approach is crucial in capturing the complexities of the entrepreneurial process, frameworks, and actors within this research. The research questions are addressed through qualitative inquiry, aligning with the chosen research paradigms. Thus, this study aims to elucidate and establish the connections between the research problem and the paradigmatic approach, which are fundamental and intertwined with the epistemological foundations. The chosen paradigm emphasizes the practical application of entrepreneurship research (Karatas-Ozkan et al., 2014).

#### **4.4 Interaction between theory and methods**

The author of this study has examined the relationship between theory and qualitative research methods and explored various approaches and their applications. The roles and significance of theory, which can vary depending on ontological and epistemological perspectives has also been considered very carefully in this research (Tavallaei & Abu Talib, 2010; Creswell et al., (2007); Mertz & Anfara, 2006; Denzin & Lincoln, 2005). Sandelowski (1993) identified four theory sources, including researchers' existing ideas, general perspectives, assumptions, and theoretical frameworks within disciplines. It is essential to distinguish between theory at the practical and paradigmatic levels, as researchers draw on different sources in qualitative research, such as interviews, grounded theory, or construct theory/idea. Theoretical assumptions also play a crucial role in investigating the selected phenomena. Applying theory in qualitative research serves various purposes, including justifying and/or rationalizing new approaches or ideas through the scientific method, which provides a comparative context and acts as an interpretive framework for data analysis and presentation of findings (Bradbury-Jones, Taylor, & Herber, 2014). Sandelowski (1993) explains how theory takes various forms, while Mertz and Anfara (2006) demonstrate the spectrum of theories, ranging from non-existent to extensively researched and influential. Alderson's observation that research is grounded in an approach or theory supports this notion

and applies to both practical and scientific research fields (Bradbury-Jones, Taylor, & Herber, 2014).

Additionally, Dubois and Gibbert (2010, p.129) provide examples of how methodological decisions can be connected to ideas and theories such as:

- Applying and developing the empirical phenomena or subjects under investigation
- Emphasizing other parts of the triangle of research dimensions depending on the theory's goal
- Creating an existing approach, developing a new system, and verifying a current view of the empirical phenomena under investigation and methodological considerations.

Chun Tie, Birks, and Francis (2019) identify key quality indicators in qualitative methodology, emphasizing the significance of the researcher's competence, knowledge, abilities, and methodological alignment with research questions. Challenges in qualitative research, spanning data collection, formation, analytical conceptualization, and field exit, have been acknowledged by scholars like Bryant and Charmaz (2007) and Michailova et al. (2014). Recognizing and addressing these challenges is essential for researchers.

Quality criteria are intricately linked to the relationships between three dimensions established through deductive, inductive, or abductive methodologies, as highlighted by Kabir (2016). The commitment to ontology and epistemology, determining researchers' views on reality and ways of acquiring knowledge, becomes pivotal in selecting and integrating research methodologies (Kivunja & Kuyini, 2017).

Guba and Lincoln (1994) emphasize the complexity of integrating multiple approaches, indicating that method selection involves theoretical considerations beyond technical aspects. Platt (1986) challenges assumptions about the intrinsic link between functionalist theories and survey data-gathering procedures, citing historical research examples that counter this notion.

Bulmer (1986) argues that method use is not inherently tied to a specific methodological position and highlights the prevalence of multi-method techniques in sociological research,

aligning with Denzin's (1978) concept of triangulation. Despite debates, Bulmer (1986) dismisses the discourse as sociological nonsense.

This study employed the deductive approach, deviating from the conventional order of conducting literature reviews after data collection. The intertwining of theory and research methodologies reflects researchers' commitment to ontological and epistemological perspectives. The strategic use of a deductive approach facilitated a continuous literature review throughout the research process, defying the conventional sequence.

While qualitative researchers face challenges such as subjectivity, limited generalizability, and resource constraints, a reflexive and meticulous approach is essential to enhance the rigour and reliability of qualitative research. This methodological awareness and a commitment to theoretical considerations contribute to the nuanced understanding and depth achieved in qualitative inquiry.

## **4.5 Research approach**

### *4.5.1 The rationale of qualitative research*

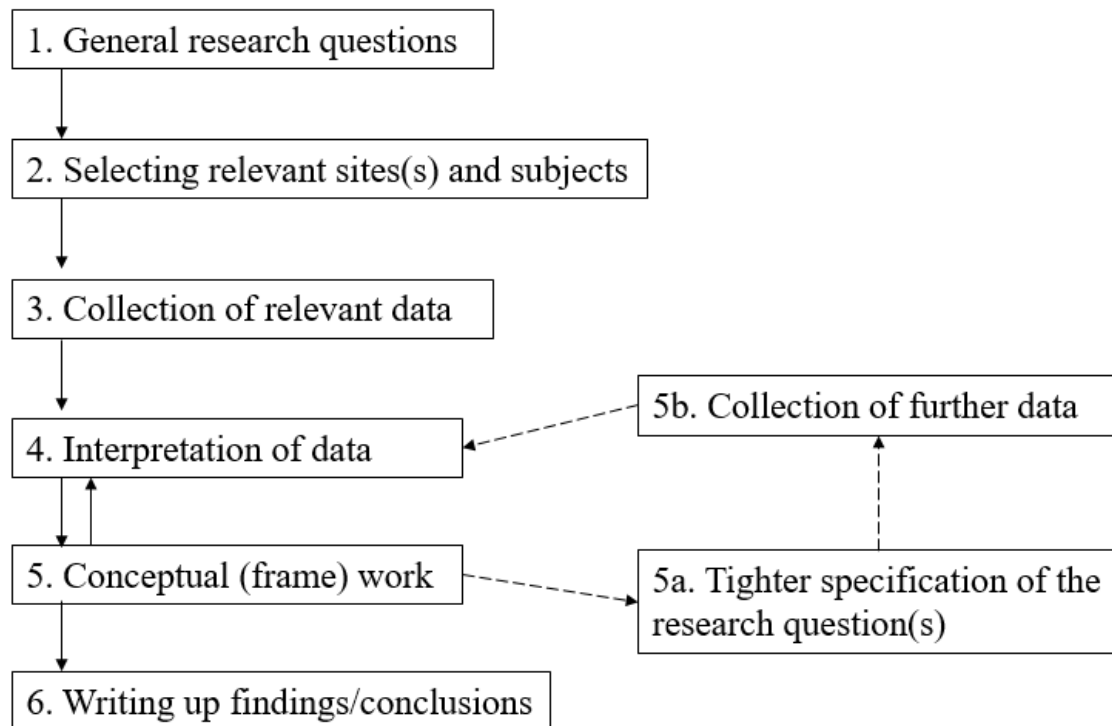
Creswell and Creswell (2017) delineate qualitative and quantitative research paradigms. Qualitative research, deeply rooted in the social sciences, seeks to comprehend the reasons and mechanisms behind human behavior (Denzin & Lincoln, 2005). It delves into information, attitudes, beliefs, and more, making it an ideal strategy with its exploratory analysis and one-on-one interviews (Miles & Huberman, 1994). Qualitative methods, as advocated by Cooper and Schindler (1998), are deemed practical and efficient for investigative studies, facilitating the identification of emerging themes during the research process. This approach proves vital in comprehending participants' decisions, shortcomings, and thoughts, aligning with the focus of this study (Saunders et al., 2003).

However, ensuring reliability is imperative in qualitative studies (Creswell & Creswell, 2017; Saunders et al., 2007; Johnson et al., 2001). Concerns about data reliability arise from inconsistent data collection, highlighting the need for specific tools to ensure consistency across multiple tests (Smith & Roberts, 2005). Transparency in consistently disclosing information is essential for establishing reliability.



#### 4.5.2 Importance of qualitative research

As emphasized by Graue (2015), qualitative research navigates interconnected challenges during various phases. Creating precise research questions is paramount to maintain focus and avoid data overload (Bryman & Bell, 2011). Research questions act as guiding principles, ensuring a balanced, testable, and comprehensible approach while connecting theory to other inquiries. Figure 4.1 illustrates the selection process, providing an overview of the research journey.



Source: Bryman & Bell, 2011<sup>4</sup>

**Figure 4.1 Selection process**

Interpretivism, aligned with qualitative methods, accentuates the subjective nature of reality and the significance of understanding individual interpretations and meanings (Saunders et al., 2012). In order to acknowledge the need for standardized data collection, interpretivism allows flexibility in evolving questions and procedures throughout the research process, enabling a nuanced exploration through methods such as action research, focus groups, case studies, and storytelling studies (Schutt, 2018).

<sup>4</sup> Note. "From Oxford University Press," by Bryman & Bell, 2011, *Business Research Methods* (3<sup>rd</sup> ed.).

#### 4.5.3 The contrast between qualitative and quantitative studies

The researcher's epistemological assumptions play a pivotal role in determining the research approach, whether quantitative or qualitative (Bryman & Bell, 2011). A qualitative approach was chosen in this study, and Table 4.1 outlines critical distinctions between qualitative and quantitative studies.

**Table 4.1      Qualitative Vs quantitative**

S/N	Qualitative	Quantitative
1	Words	Numbers
2	Participant's Perspective	Researcher's Perspective
3	Close the researcher	Keep the researcher away
4	Theory Emerging	Theory testing
5	Process	Static
6	Unstructured	Structured
7	Contextual understanding	Generalization
8	Rich and Reliable Data	Hard and Reliable Data
9	Micro	Macro
10	Meaning	Manipulation
11	Natural Environment	Artificial Environment

Source: Bryman & Bell, 2011<sup>5</sup>

A fundamental distinction lies in focus: qualitative research centres on participants' perspectives, while quantitative research revolves around the researcher's viewpoint (Bryman & Bell, 2011). In qualitative research, the researcher's engagement is crucial for a deeper understanding, whereas quantitative analysis often maintains a distance to ensure objectivity. Qualitative approaches have proven invaluable in exploring diverse issues providing rich insights into complex contextual matters. For example, qualitative research facilitated a nuanced understanding of farmers' experiences, social entrepreneurship, sustainable food production, and food security in Bangladesh (Chamlee-Wright, 2010).

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<sup>5</sup> Note. "From Oxford University Press," by Bryman & Bell, 2011, *Business Research Methods* (3rd ed.).

Face-to-face interviews, a form of synchronous communication regarding time and place, capture verbal and non-verbal cues, offering contextual information. While beneficial, face-to-face interviews have drawbacks, including transcription time and coordination challenges across locations. Nonetheless, they enable an immediate exchange of information with minimal time delay between questions and answers (Emans, 1986). In the context of this study, qualitative interviews were conducted in Gaibandha, Bogra, and Bhola, lasting 60 to 90 minutes each, employing semi-structured in-depth interviews as practical tools for data collection.

Qualitative research is widely adopted to explore relationships and characteristics within entrepreneurial ecosystems (Graebner, Martin, & Roundy, 2012). The richness of qualitative data facilitates a detailed exploration of various ecosystem characteristics, proving valuable for testing propositions in research studies.

#### **4.6 Sample size**

In establishing a nuanced perspective on our research topic, our study incorporates participants from various levels, contributing to a comprehensive understanding. We engage approximately 25 participants from diverse backgrounds at the micro level, strategically selected to provide unique perspectives. This includes model farmers from three districts in Bangladesh and individuals from the Department of Agricultural Extension (DAE) and government agencies, offering localized insights.

##### **Micro Level Participants:**

- These individuals are directly involved in the research topic at the individual or local level.
- In this study, micro-level participants include:
  - Model farmers engaged in milk and beef production from three districts in Bangladesh.
  - Individuals from the Department of Agricultural Extension (DAE) and government agencies are involved in project management, program implementation, policy frameworks, and administration.

**Meso Level Participants:**

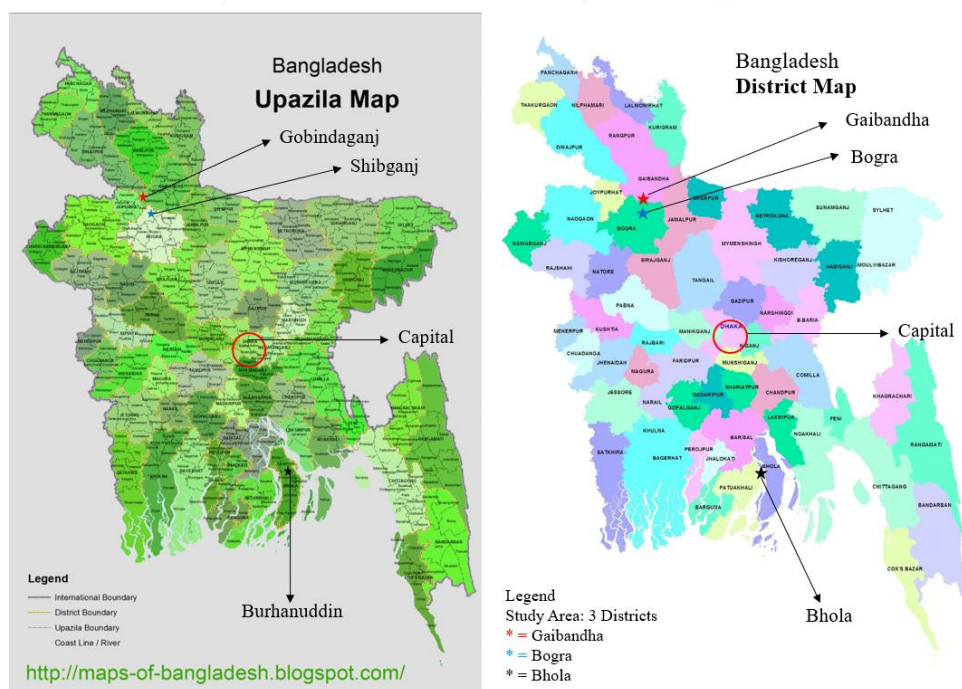
- These are participants at the organizational or community level, representing intermediate structures.
- In this study, meso-level participants include:
  - Participants from non-governmental organizations (NGOs) and the private sector, focusing on TMSS (one of the largest NGOs in Bangladesh) and other organizations involved in agribusiness operations.
  - Private sector stakeholders such as suppliers, customers, and financial institutions

**Macro Level Participants:**

- These are participants at the broader societal or systemic level.
- In this study, macro-level participants include:
  - Individuals from government agencies engaged in project management, program implementation, policy frameworks, and administration.
  - Non-governmental organizations (NGOs) like TMSS play a significant role in the development sector.
  - The Upazila office recognizes milk and beef producers as model farmers, representing a broader agricultural community.

The participants in this study are strategically distributed across micro, meso, and macro levels. At the micro level, individual farmers with recognized expertise and government officials affiliated with the Department of Agricultural Extension contribute valuable insights. At the meso level, the study involves representatives from NGOs and private sector stakeholders, including TMSS, one of the largest NGOs in Bangladesh. This diverse selection encompasses various perspectives, such as agribusiness operations, TMSS loan beneficiaries, and stakeholders like suppliers, customers, and financial institutions. Finally, government agencies and NGOs play a pivotal role at the macro level, providing a broader societal context. This multi-level approach ensures a comprehensive understanding of the research topic, considering the viewpoints of individuals, organizations, and overarching societal structures.

## Study area in Northern and Southern parts of Bangladesh



Source: Palash, 2020<sup>6</sup>

**Figure 4.2 Bangladesh Upazila Map & Bangladesh District Map**

Figure 4.2 illustrates all the Upazilas and districts of Bangladesh. The locations where data were collected through interviews are denoted by arrows on the map.

## 4.7 Data collection

### 4.7.1 Secondary data

The utilization of secondary data pertains to information collected by other entities, with researchers not assuming responsibility for its management (Greenhoot & Dowsett, 2012). In this research project, thoughtfully selected secondary data sources were obtained from organizations such as the Department of Livestock Services (DLS), NGOs, and private entities to assess economic activity in a specific area. The suitability of the datasets was ensured, and a verification process was conducted to confirm that they had not undergone manipulation or alteration.

The analysis of the secondary data set revealed two broad classifications: internal and external data from the DLS. Internal data sources included records of milk and beef farmers,

<sup>6</sup> Note. Palash, B. (2020). Maps of Bangladesh, Political, Physical, Geological, Archeological, and other types of maps of Bangladesh. *Maps of Bangladesh*. (<http://maps-of-bangladesh.blogspot.com/>)

vaccination services, artificial insemination services, field visit history, training program descriptions, disease and animal health care services, and meetings with listed farmers monthly, quarterly, and annually. External data sources included forecasts of annual sustainable milk and beef production, actual milk and beef production, whole milk and beef production zones, annual shortages or surpluses of milk and beef production, and government reports at the zone-wise, district-wise, and national levels.

Utilizing secondary data proved to be a cost-effective and convenient source of information as these organizations had well-maintained data sets that were relatively easy to manage. Additionally, using secondary data can save time in analyzing and interpreting findings. It can be used exclusively or for comparative purposes, aiding in longitudinal research for in-depth investigation. However, it is essential to note that while secondary data analysis offers many benefits, it may only suit some researchers or research issues. The data set has already been collected, and the researcher has no control over the sampling, constructs tested, or examination methods (Greenhoot & Dowsett, 2012). Thus, the initial step in determining the appropriateness of this strategy is to assess if an existing data set aligns well with the investigation or research question.

However, secondary data sets may also have disadvantages, such as outdated data, limited or missing data, or unreliable study data (Hox & Boeije, 2005). Furthermore, the data set was collected by individuals or organizations for their purposes, which may not fully address the research question at hand. Therefore, researchers should carefully evaluate the quality and relevance of the secondary data set to their research question before utilizing it.

In conclusion, using secondary data can be a valuable strategy for researchers, but it is essential to consider its advantages and disadvantages. Researchers should assess the quality and relevance of the data set to their research question and carefully evaluate any potential limitations before incorporating secondary data into their research.

Additionally, secondary data were gathered through archival research, encompassing government reports, journals, magazines, books, articles, and government databases. Reflexive notetaking and field notes were employed during the interviews to ensure the documentation of significant information and capture contextual details.

Data triangulation was implemented to enhance the validity of the data. This approach involved cross-referencing information from various sources to ensure consistency and reliability. This method aimed to test and validate the findings obtained from different instruments, thereby exerting control over potential threats or influences that could affect the results.

Due to delays experienced during the Zoom interviews, the fieldwork had to be postponed for six months until it was deemed safe to travel to Bangladesh. This delay allowed the researcher to conduct follow-up interviews with the participants in person, allowing for more direct and immediate interaction.

#### *4.7.2 Semi-structured in-depth interviews*

In this study, the data collection process employed in-depth semi-structured Zoom interviews, a method known for gathering participants' opinions and expertise through predefined questions or themes, allowing for participant elaboration (Blandford, 2013). Semi-structured interviews, in contrast to structured ones, offer flexibility to explore unexpected pathways, providing valuable insights into people's viewpoints and experiences (Flick, 2018).

Ensuring the quality of the interview process requires extensive preparation, involving the development of a subject guide covering topics for discussion during the interview (Arthur & Nazroo, 2003). Using a topic guide or interview schedule proves advantageous for the interviewer, offering a framework while allowing flexibility and responsiveness to participants' input.

The interview process focuses on establishing a positive relationship between the interviewer and interviewee, recognizing the interviewer as a research instrument (Legard, Keegan, & Ward, 2003). Various questioning techniques, including broad and narrow inquiries, are employed, avoiding leading questions and ensuring clarity. In-depth interviews may utilize strategies such as the critical incident technique or the required decision method for detailed information (Flanagan, 1954; Klein, Calderwood, & Macgregor, 1989).

Charmaz (2006) underscores the importance of active listening, empathy, asking open-ended questions, and refraining from passing judgment during interviews. The role of the interviewer

in shaping the dialogue is acknowledged, emphasizing the contextual and negotiated nature of the interview process.

This study employed sophisticated, semi-structured, in-depth interviews as the primary data collection method, conducting 25 interviews across three categories, totaling 26 hours and 55 minutes (see Table 4.2). Audio and video data were collected and transcribed from Bengali to English, utilizing a multimodal transcript approach focusing on verbatim transcript services for accuracy and consistency with the study's methodology. Despite the challenges and workload associated with transcription, it proved valuable in gaining insights into participants' perspectives and creating a clear and comprehensive dataset.

The interviews were conducted to collect essential information by fostering relationships and extracting participants' experiences, stories, and insights into business, farm operations, and household food security. Government officials and private organizations provided crucial insights into the management process, opportunities, and long-term benefits for milk and beef farmers, rural Bangladesh's primary food production sources.

Table 4.2 presents a categorized list of interviews conducted during the research, including information on participants' positions, farms/organizations, total participants, complete interviews, interview durations, dates, follow-up interviews, and research locations and districts. The interviews were conducted across three categories: milk and beef farmers, the Department of Livestock Services (DLS), and other organizations (Grameen Bank, TMSS-1, TMSS-2, and Yunus Centre), totalling 25 interviews with an average duration of one hour and minute minutes.



**Table 4. 2      The category and list of interviews**

1 <sup>st</sup> Category /Type	Position	Farms/or ganizatio ns	Total partic ipants	Duration of interview s	Date of intervie ws	Follo w-up interv iews	Research locations	District
Milk and beef farmers	Farm- based entreprene urs	Farm (producin g milk and beef)	7	7 hrs.	17/11/2 0- 23/03/2 1	Yes	Gobinda ganj Upazila	Gaiband ha
Milk and beef farmers	Farm- based entreprene urs	Farm (producin g milk and beef)	6	6 hrs.	24/12/2 0- 31/01/2 1	Yes	Shingonj Upazila	Bogra
Milk and beef farmers	Farm- based entreprene urs	Farm (producin g milk and beef)	6	6 hrs.	31/01/2 1- 24/04/2 1	Yes	Borhanu ddin Upazila	Bhola
2 <sup>nd</sup> Category	-	-	-	-	-	-	-	-
Departm ent of Livestoc k Services (DLS)	Upazila Livestock officer and veterinary surgeon	Upazila Livestoc k Office	2	3 hrs.	10/12/2 0	Yes	Gobinda ganj Upazila	Gaiband ha
3 <sup>rd</sup> Category	-	-	-	-	-	-	-	-
Grameen Bank (GB)	Branch Manager	Specializ ed Bank	1	1 hr.	25/04/2 1	Yes	Gobinda ganj Upazila	Gaiband ha
TMSS-1	Branch Manager	NGOs	1	1 hr. 30 minutes	24/12/2 0	Yes	Gobinda ganj Upazila	Gaiband ha
TMSS-2	Branch Manager	„	1	1 hr. 15 minutes	28/02/2 1		Shibgonj Upazila	Bogra
Yunus Centre (YC)	General Manager	Private organizat ion	1	1 hr. 10 minutes	22/11/2 0	Yes	Grameen Danone Foods ltd., Bogra	Dhaka
Total	-	-	25	26 hrs. 55 minutes				
Average	-	-	25	1 hrs. 4.6 minutes				

*Interview protocol and information sheet*

Participants were required to sign a specific consent form indicating their agreement to participate in the study. The interview process was carefully designed and divided into six stages to ensure a systematic and practical data collection process. Appendix 1.3 of the study includes the interview protocol and information sheet provided to the participants before their interviews.

The initial stage of the interview process involves setting up the internet connection and Zoom application for the interviewee, which is crucial as it establishes the tone for the subsequent discussion. In the following stage, the interviewer dedicates the initial few minutes to building trust with the participant and gather background information to establish the necessary context for the interview.

The third stage involves providing participants with an explanation of the study's purpose and obtaining their informed consent before proceeding with the interview. In the fourth stage, participants are requested to consent to the interview recording and are informed of their right to withdraw from the study at any point.

The fifth stage focused on discussing research themes, allowing participants to delve deeply into topics that may not typically occupy their thoughts. Finally, in the sixth and final stage, the interview is concluded, allowing participants to address any remaining matters before the session ends. At the end of the interview, participants are informed about the subsequent steps and how their data will be handled. It is important to note that participants may recall additional information after the interview concludes, highlighting the need for thorough documentation of the interview session.

In order to ensure the accuracy of the interviews, government officials, Grameen Bank, NGOs, and private organizations were requested to provide evidence related to the interview protocol. Additionally, milk and beef farmers were asked to present supporting documents such as awards, skill-based knowledge certificates, training qualifications, income statements, and balance sheets as part of the secondary data in the section.

#### *Conducting interviews over Zoom*

The study delves into utilising Zoom, a versatile cloud-based video conferencing service, for interview purposes. Zoom stands out with its user-friendly interface, allowing real-time connections across multiple devices, a distinguishing feature compared to other Voice over Internet Protocol (VoIP) technologies (Inc., 2016). It offers secure session recording and storage without needing third-party software, bolstering data protection measures. Despite these advantages, the comprehensive impact of VoIP technologies, specifically Zoom, on qualitative data collection remains an area under exploration. Existing research has primarily concentrated on asynchronous online forums, leaving gaps in understanding participants'

experiences (Fox, Morris, and Rumsey, 2007). In addressing this, the study focuses on participants' perspectives and practical experiences with Zoom interviews, particularly relevant as participants are dispersed across Gaibandha, Bogra, and Bhola in Bangladesh. By evaluating Zoom's potential utility in qualitative data gathering, the study expands methodological possibilities for qualitative researchers and provides practical insights for future research applications.

### *The help of an assistant*

In the context of distance interviewing, particularly during the challenges posed by the COVID-19 pandemic 2020, the role of an in-situ assistant proved pivotal, especially when dealing with participants like farmers lacking technological expertise for platforms such as Zoom. This highlighted the necessity of insights into discovering, hiring, and effectively working with research assistants, addressing a knowledge gap for qualitative social science researchers. The discussion emphasized practical considerations for assessing the need for an assistant, tailoring the working relationship to the specific project's requirements, and acknowledging power dynamics. Strategies were developed to enhance research quality, emphasizing ethical practices and the importance of seeking guidance. Scholars in cross-cultural studies within the social sciences were urged to engage in reflective discussions on hiring and supporting research assistants in diverse contexts.

In this study, the chosen research assistant, well-versed in field knowledge and experience, adhered to established consent protocols aligned with university guidelines regarding confidentiality and data handling. Cituli Alinirhu's survey (2021) underscored the importance of expanding research assistants' roles beyond data collection, highlighting their crucial contribution to data analysis and understanding environmental and social dynamics. The assistant was pivotal in various tasks, providing invaluable insights from nonverbal cues. The study advocates for more opportunities for research assistants to contribute to the research process actively, emphasizing their significance in qualitative research.

The challenges posed by the COVID-19 pandemic further underscored the need for adaptability. Face-to-face interviews became impossible due to government-imposed restrictions, leading to the adoption of Zoom interviews, which presented specific challenges and rescheduled needs. On December 10, 2020, a positive COVID-19 test prompted the postponement of an interview until the respondent tested negative and completed isolation.

Travel restrictions in April 2021 posed challenges in reaching certain areas, necessitating rescheduling and assistance for Zoom setup. Public health considerations guided rescheduling, emphasizing the need for flexibility and adaptability in conducting interviews amidst Bangladesh's lockdowns, travel bans, and movement restrictions.

#### *Methodological challenges of data collection*

During the data collection process several challenges were encountered that can be categorized into the following themes:

1. Location: The selected marketplace location, chosen for its high-speed internet connection, posed challenges to participants' ability to express themselves freely.
2. Health Literacy: Limited health literacy among participants affected their understanding of interview questions and hindered their ability to provide comprehensive answers, impeding data collection.
3. Duration of Data Collection: The time participants spent providing data influenced their willingness to answer questions and share information.
4. Researcher Fatigue: It is acknowledged that participant fatigue could impact data collection. For instance, conducting interviews with intellectually exhausted participants affected the data collected, and fatigue affected the flow of interview discussions.

These challenges had an impact on the data collection process and should be considered when interpreting the results of the study. Understanding these challenges helps provide context and highlights potential limitations that may have influenced the findings.

#### *4.7.3 Reflexive field notes*

Reflexivity is an increasingly important topic in organizational research, particularly in qualitative research methods, as researchers aim to become aware of their influence on the research process and outcomes (Haynes, 2012). Qualitative data collection methods, such as jotted notes, direct observation, inference, analysis, interview notes, and personal papers, have proven instrumental in generating comprehensive field notes critical to understanding and interpreting research data (Deggs & Hernandez, 2018).

In this study, during the in-depth interviews with 25 participants, field notes were diligently recorded using keywords and shorthand to capture vital information. These notes were

subsequently transcribed, organized, and reviewed daily, with supplementary thoughts and questions incorporated when needed. The existing literature suggests that field notes were then subjected to coding and analysis techniques such as open coding, thematic coding, and grounded theory analysis, facilitating a thorough examination, and uncovering of previously undisclosed insights (Phillippi & Lauderdale, 2018; Brule & Eckstein, 2017).

To ensure credibility and value of the collected data, reflexivity and positionality were combined, employing methodologies and strategies to avoid misunderstandings or misrepresentations of the naturalistic research environment (Deggs & Hernandez, 2018). Additionally, Schwandt (2014) emphasized the significance of reflective field notes, which capture researchers' thoughts, ideas, questions, and concerns while observing and critically analysing their observations and experiences.

In conclusion, using comprehensive field notes and reflexivity in qualitative research methods can enhance the credibility and value of the collected data, enabling researchers to better understand and interpret the research findings. Researchers should strive to maintain a systematic and organized approach to data collection and analysis while employing methodologies and strategies that enhance the credibility and value of the data.

#### *4.7.4 Data triangulation*

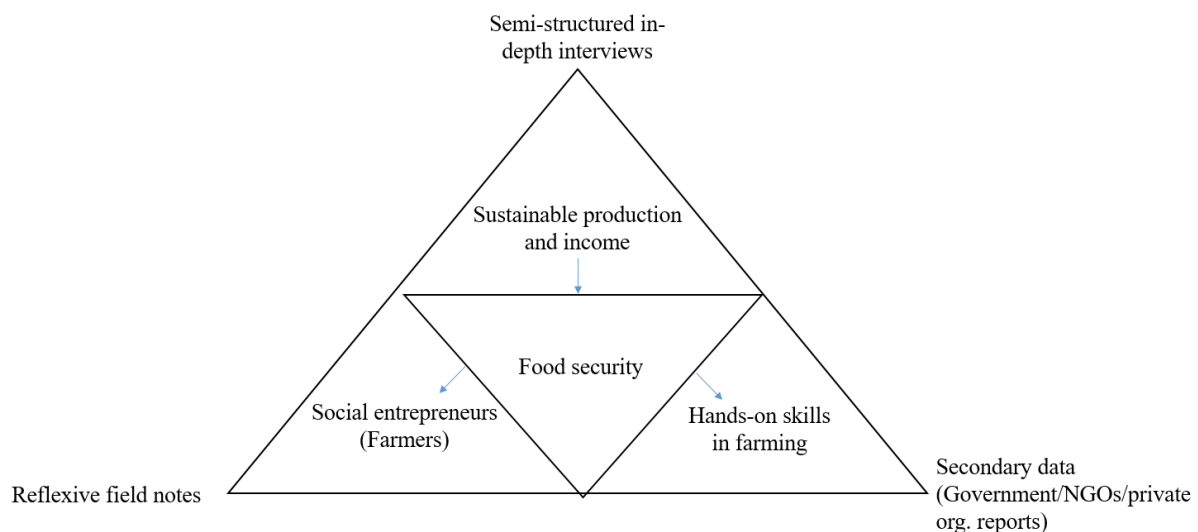
The term "triangulation," rooted in nautical and land surveying, involves cross-validating data to enhance research validity and reliability (O'Donoghue & Punch, 2003). This approach is applied in quantitative and qualitative research, integrating diverse sources, such as primary data from interviews and observations supplemented by various secondary sources (Decrop, 1999).

Qualitative studies often adopt multiple analytic methodologies on the same dataset. For example, Wertz (2011) utilized grounded theory, discourse analysis, and narrative techniques within a single interview. Four types of triangulations—method, investigator, theory, and data source—contribute to more reliable knowledge when combined (Patton, 1999; Denzin, 1978).

Triangulation enhances the reliability of results by incorporating data from different sources. Using two measurement methods and comparing results strengthens the findings' reliability;

however, divergent results suggest potential unreliability (Bryman, 2006). Despite challenges critics raise (Graue, 2015), this methodological diversity contributes to a more robust research framework.

In a study focusing on social entrepreneurs (farmers) across three districts (Figure 4.3), triangulation assessed aspects over five years using in-depth interviews, reflexive field notes, and secondary sources (Oliver-Hoyo & Allen, 2006). The emphasis on food security revealed the significance of sustainable production, income, and diversification, challenging prevailing government reports.



*Sources: Oliver-Hoyo & Allen, 2006<sup>7</sup>*

**Figure 4.3 The line diagram of triangulation**

Qualitative data collection methods, such as interviews and field notes, highlighted sustainable production and income diversification for food security. Triangulation ensured the credibility of conclusions by drawing from in-depth interviews, reflexive field notes, and secondary sources, addressing potential limitations of semi-structured interviews (Kidder & Fine, 1987). While perspectives from secondary data obtained from government offices, NGOs, and private organizations were considered, primary data was deemed more reliable (Wiersma, 2000).

<sup>7</sup> Note. "From The Use of Triangulation Methods in Qualitative Educational Research," by Oliver-Hoyo & Allen, 2006, *Journal of college science teaching*. (<http://faculty.yu.edu.jo/Audeh/My%20Gallery/papers%20and%20documents/qualitative%20paper4.pdf>)

In acknowledging potential errors in semi-structured interviews, the study employed triangulation to address incomplete or incorrect information, underscoring the risk of relying solely on qualitative sources and emphasizing the careful consideration of results from multiple data collection methods.

In conclusion, triangulation with secondary data contributes to the validation of qualitative conclusions, enhances research robustness, and facilitates informed decision-making for farm-based social entrepreneurs' food security.

#### **4.8 Ethical considerations**

Conducting research during a global pandemic raises complex ethical issues, and each methodological technique comes with unique ethical considerations (Jowett, 2020). This study has carefully considered the various ethical issues involved, and the necessary ethical approvals have been obtained from the Human Ethics Committee at the University of Canterbury. This research is required for a PhD thesis and does not involve deception, threat, invasion of privacy, mental, physical, or cultural risk, or stress.

Sensitive personal information is not collected from or about the participants, and all research leads have been conveyed throughout the research process. Potential participants were initially contacted and invited to discuss the research and their involvement, followed by the distribution of information sheets and consent forms. The information sheet clearly outlines the study's investigation, aims, and objectives, as provided by the Human Ethics Committee. The ethical framework the Human Ethics Committee provided has enabled fruitful research discussions between participants and the researcher during the data collection process. In addition, the Committee's guidelines have been essential in ensuring ethical research practices are maintained throughout the study.

The researcher has taken the time to understand the interview methodology and its potential impact on participant engagement with the research process. The theoretical and methodological position of the qualitative interview for this research project has been carefully considered, ensuring that participants can respond and discuss freely without external limitations (Husband, 2020).

#### *4.8.1 Confidentiality*

All eligible individuals can participate in this study through a semi-structured interview utilizing a pre-designed protocol. The study has undergone review and approval by the University of Canterbury Human Ethics Committee in New Zealand, and participation is entirely voluntary. Participants can withdraw from the study at any stage without adverse consequences, and their information can be removed upon request. After completing the research project, participants may receive a copy of the results, ensuring complete confidentiality throughout the study. The participants' identities are kept confidential, and their information will not be referenced without explicit consent. In order to maintain anonymity and confidentiality, participant data were securely stored in an encrypted electronic format, accessible only to the researcher and supervisors. Raw data, including interview transcripts and consent forms, will be destroyed after ten years.

The research outputs, such as lectures, presentations, conferences, and journal articles, will be publicly accessible. The doctoral thesis will also be available at the University of Canterbury Library. Ethical considerations in research encompass fundamental principles that guide research design and practice, including voluntary participation, informed consent, anonymity, confidentiality, potential harm, and communication of results. This study has thoroughly addressed these principles to ensure adherence to ethical guidelines.

#### *4.8.2 Trust building in participants*

Participants can be assured that their data has been handled confidentially and stored securely. Unique codes have been assigned to each participant to ensure their anonymity, and these codes have been used in the transcription, analysis, and publication of the results. The research team is the only one with access to the participants' information, stored on a password-protected file on the University of Canterbury server.

No data or files have been uploaded to the cloud, and all hard copies of files have been destroyed after being transcribed and converted into electronic format. Digital signatures on consent forms and anonymous data have been stored on the UC secure server, while original copies of signed consent forms are securely stored in a locked unit with individual card access at the University of Canterbury. The university authority is responsible for destroying the raw data from this PhD work after ten years.



Upon completion of the PhD, the thesis will be deposited in the UC Library and made publicly available through the university. Additionally, the research findings will be utilized for conference papers or journal publications, and a summary of the results and reports will be provided to the participants. There is no intention to utilize raw data once this research project is completed. However, the findings have been and will be used for conference papers, lectures, seminars, presentations, and journal publications.

All information, safety, and security processes adhere to the data protection act, and participants can trust the research team. The PhD candidate comes from the same background and platform in northern Bangladesh. This researcher went a long way in building trust between the participants and the researcher.

## **4.9 Data analysis**

### *4.9.1 Thematic analysis*

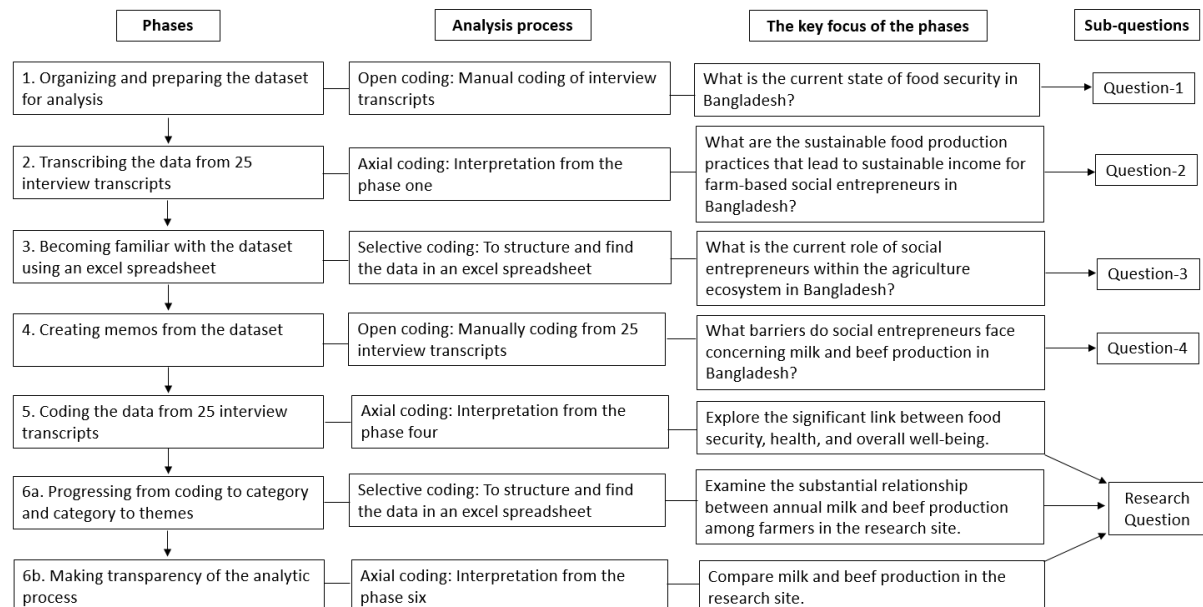
Thematic analysis involves the identification of patterns within a dataset (Braun & Clarke, 2019). This analytical approach encompasses different methods and techniques. The adaptability and flexibility of thematic analysis make it widely applicable across various fields. Its utilization has been observed in education, medicine, health services, human resource development, tourism, and psychology (Cassol et al., 2018; Nowell, Norris, White, & Moules, 2017; Costa et al., 2016; Frith & Gleeson, 2004), highlighting its versatility and utility in diverse research contexts.

According to Lochmiller (2021), thematic analysis is a specialized form of research that researchers can learn and master as a foundational approach. Braun and Clarke (2006) and Joffe (2011) outline that thematic analysis involves deriving findings through either a data-driven or theory-driven approach, depending on the research question. It is a systematic method that utilizes analytical practices to identify common themes and relationships within a dataset (Miles & Huberman, 1994). While unsuitable for all qualitative research designs, thematic analysis remains an innovative and valuable approach to analyzing qualitative data (Wang & Roulston, 2007).

According to Smith (2006), qualitative data analysis is a systematic rather than a linear process. As a result, researchers can develop a step-by-step approach to ensure a comprehensive analysis. Thematic analysis, although flexible, can still be conducted in an

ordered manner. The importance of a transparent data analysis process has been emphasized by Lester and Lochmiller (2021). They argue that a structured data analysis process with multiple stages adds value to the research.

The thematic analysis process, comprising six steps, is illustrated in Figure 4.4 below.



**Figure 4. 4 The thematic analysis process**

As depicted in Figure 4.4, the initial phase for thematic analysis involved conducting individual Zoom interviews accompanied by detailed notetaking. Following this, data were transcribed from Bengali to English and stored electronically in MS Word and PDF files. A protocol was established, and a master dataset was created in an Excel spreadsheet, listing individual data sources and their storage locations for easy access during analysis. The dataset was systematically organized to facilitate thematic analysis and accommodate additional file imports for ongoing research. The research structured the data by applying open, axial, and selective coding, uncovering critical themes associated with food security, food production, social entrepreneurship, and the entrepreneurial ecosystem.

The process involved identifying key components such as the first-order quote, interpretation, theme, theoretical aspect, and category (Batra, Ahuvia, & Bagozzi, 2012). The first-order quote represents a direct excerpt from the participants' interview responses, capturing their original words and expressions. It is a concrete example reflecting their experiences, opinions, or beliefs related to the research topic (Tierney, 2012).

Interpretation involves the researcher's understanding and analysis of the first-order quote. It provides insights into the participants' statements' underlying meaning, implications, or significance. Interpretation helps to uncover the participants' perspectives and shed light on the research questions or objectives (Bowen, 2009). Themes refer to recurring patterns or topics from the participants' responses. These themes represent common threads or ideas across multiple or individual interviews. They allow for the organization and categorization of the participants' insights, providing a structured framework for analysis.

Theoretical aspects connect the participants' experiences and perspectives to existing theories or conceptual frameworks. It entails examining the underlying principles or concepts that underpin the themes and relating them to established theoretical frameworks in the field of study (Kumar & Antonenko, 2014). This process helps to establish a theoretical foundation and enrich the analysis. Categories serve as broader labels or classifications encompass multiple themes or aspects of the research topic. They facilitate the organization and grouping of similar themes or ideas, enabling a systematic analysis of the participant's responses. By incorporating these elements into the analysis, a comprehensive understanding of the participants' perspectives can be achieved, allowing for meaningful insights and conclusions to be drawn from the research data.

#### *4.9.2 Food security data structure and themes*

Table 4.3 presents data structure of food security. During the iterative coding and interpretation of the participants' quotes, the research was able to identify the key challenges that farmers face in achieving food security.

**Table 4. 3      Data structure for food security**

Participants	1 <sup>st</sup> order quotes	Interpretation	Theoretical aspect	Theme
SAK	“I have not employed crossbreeding in my dairy farming operations since people in my area prefer locally sourced milk from indigenous breeds. Instead, I have opted for a good marketing strategy. However, the indigenous breeds have less milk production due to genetic limitations, and as a result, I cannot meet the demand for milk and am not achieving sustainable production and income levels.”	The participant opted out of crossbreeding techniques in their dairy farming to align with the local preference for indigenous breed milk. Instead, they prioritized a robust marketing strategy. However, the indigenous breeds' milk production is hindered by genetic limitations, leading to insufficient supply to meet demand, and hindered sustainability and income goals.	Food Security	Yield
SHR	“I have experienced numerous food crises in the past due to limited resources. While I can produce enough food from my land and beef-fattening farm to sustain my family for six months, I need more resources to diversify my income. As a result, I cannot grow additional crops to support my household, farm, and the children living in the rural areas.”	The participant faces challenges of food shortages and limited resources, sustaining his family for only six months with current farming activities. Expansion requires additional resources, and diversifying income is essential, but assistance is needed. Unfortunately, these limitations hinder the participant's ability to support their rural household, farm, and children adequately.	Food Security	Scarcity
ZIA	"I am spending more on boys and girls, household expenses, medical expenses, and food. My income has decreased due to floods, weather impacts, and other limited resources. My crop yield has been reduced. I have a food shortage yearly due to a lack of farm production, such as milk production and mixed crops. I still have a food security problem due to a lack of resources, facilities, and shortage of crop yield."	The participant faces increased household, medical, and food expenses for boys and girls. However, floods, adverse weather, and limited resources have reduced income and crop yield, resulting in an annual food shortage. To overcome these challenges, additional resources and facilities are necessary to improve crop yield and address food security. This highlights the participant's struggle with income and food security due to natural disasters and limited resources.	Food Security	Yield

SAI	"I manage my household and utilize the farm's profits when needed. Our household also benefits from ongoing cropland production, home gardening, and fisheries. However, we are facing production challenges due to issues with breed selection and the health of our dairy cattle, resulting in lower production yields and limited income diversification for the household."	Increasing milk production from a 20-litre-per-day cow can boost household income, enabling the exploration of additional income-generating avenues and overall earnings growth. Farm milk production is a substitute income source, enhancing food security and family support. However, the farm's profitability determines the success of secondary income streams.	Food Security	Livestock health
JEW	"I became interested in dairy farming, fisheries, and crop cultivation due to the common practice of owning 1-2 cows or bulls in my village. I aimed to diversify our income sources through crop-livestock integration, eventually leading to multiple revenue streams and profitability. Unfortunately, adverse weather conditions and the effects of climate change made it difficult to sustain our operations, and we encountered numerous challenges."	Motivated by shared ownership of livestock, the participant ventured into dairy farming, fisheries, and crop cultivation to diversify income streams. Integration of these practices aimed to generate multiple revenues and enhance profitability. However, their operations encountered obstacles from adverse weather conditions and climate change impacts.	Food Security	Diversifying
ASA	"Increased production can increase income, especially if my cow yields 20 litres of milk daily. By ensuring that my cows receive high-quality food, proper nutrients, and enough space to exercise, I can improve the breeding quality and enhance milk production on the farm. This, in turn, helps to improve food security for my family by ensuring that we have access to an adequate supply of food and the economic means to obtain it. Additionally, we can make better use of the food in our household, which further supports our overall well-being."	The participant emphasizes that improving milk production on a farm can lead to higher income and better food security. In addition, they suggest that providing cows with high-quality food, proper nutrients, and exercise can improve breeding quality and milk production, improving household well-being.	Food Security	Yield
SAL	"I cultivate 2 acres of land and run dairy and cattle fattening project, providing a steady cash flow. However, I still need financial help during the lean season or crop cultivation periods. Although I have multiple sources to increase my food security, my household still experiences food insecurity. In addition, adverse	The participant manages 2 acres of land, operating dairy and cattle fattening project for consistent income. However, financial aid is needed during lean seasons or crop cultivation periods. Despite multiple income sources, the household faces food insecurity due to yearly shortages caused by adverse	Food Security	Climate change

	weather conditions, such as floods, drought, and uneven weather patterns, have prevented me from increasing my crop production, leading to yearly food shortages.”	weather conditions like floods, droughts, and unpredictable weather patterns impacting crop production.		
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Table 4.3 clearly indicates that all participants agree that factors such as yield, scarcity, diversification, livestock health and climate change significantly influence their own food security. The challenges faced by the participants, such as limited resources, weather conditions, and genetic limitations in indigenous breeds, were also discussed. The participants emphasized diversifying their income sources and increasing yield to achieve sustainable production and income levels. The participants highlight the significance of income and the diversification of production sources in ensuring food security, as these factors can impact various aspects, including weather conditions, crop yields, and livestock health. Food security is largely linked to the ability of farmers to engage in sustainable food production.

#### 4.9.3 *Food production data structure and themes*

All the participants highlighted their experiences and challenges related to sustainable food production. Table 4.4 presents data structure and aggregated themes for food production. The participants emphasized the importance of income diversification in overcoming market volatility, political influence, and corruption. Participants also stressed the dependence on various factors for sustainable income, such as maintaining production, favorable climate conditions, disease prevention, and market access. Challenges mentioned include unfair milk prices, unexpected feed costs, limited market access, and the cultural practice of bribery hindering loan approvals. The impact of natural disasters, such as floods and uneven weather patterns, on crop and livestock production, leading to financial difficulties and disease concerns, were significant for all the participants. Overall, the participants emphasized the need for support in accessing broader markets, improving production sustainability, and addressing corruption and climate change issues to ensure sustainable food production.

**Table 4. 4 Data structure for sustainable food production** (output of phase 1 of data analysis)

Participants	1 <sup>st</sup> order quotes	Interpretation	Theoretical aspect	Categories
FIR	"In 2010, I started my farm with four heifers after selling two female calves and reinvesting the profits into purchasing two more. Over time, I expanded my operations to include crop-livestock integration and fisheries and introduced mixed cropping to generate multiple sources of income. However, the market's volatility, political influence, and corruption have made relying on a single income stream difficult, prompting me to seek income diversification."	Starting in 2010 with four heifers, the participant's farm grew through reinvestment and now includes crop-livestock integration and fisheries for diversified income. However, market instability, political influence, and corruption necessitate diversification, as relying on a single income source proves challenging.	Sustainable Food Production	Diversifying
ANI	"I sustain my family's needs as a farmer through milk and beef production. Sustainable practices, favourable climate conditions, disease prevention, and market access are essential for income sustainability. However, while stable production ensures some food security, low output limits our income's ability to meet our food needs fully."	The participant prioritizes sustainable practices, a favourable climate, disease prevention, and reliable markets for long-term income sustainability in milk and beef production. While their stable production contributes to food security, it needs to meet their family's needs, emphasizing the necessity to increase production to fulfil food requirements and enhance income capacity adequately.	Sustainable Food Production	Climate change
SYD	"After selling milk, I saved enough money to purchase another dairy cow, resulting in a regular sale of 40 litres per day. However, my attempts to increase my income are challenged by several factors, including unfair milk prices, unexpected feed costs, a shortage of skilled workers, and limited market access due to infrastructure and transportation issues. These challenges prevent me from achieving sustainable income and sustainable food production."	The participant increased their milk production by purchasing another dairy cow through savings. However, the participant faces challenges such as unfair milk prices, unexpected feed costs, and limited market access, preventing them from achieving sustainable income and food production.	Sustainable Food Production	Accessing markets
SHA	"I am seeking assistance to expand the sale of milk within my area as I face challenges in accessing a broader customer base. Most of my	The participant requires help to expand their milk sales within their area as their current customer base is limited to local customers	Sustainable Food Production	Accessing markets

	regular customers are local shops and tea stalls, and I need more market access to attract buyers from outside the area."	who buy milk from the traditional market. In addition, regular customers are limited to local shops and tea stalls, and the lack of market access prevents buyers from outside the area.		
SHR	"I anticipate higher milk production and profit this year than last year, with a daily production target of 60-65 litres. I plan to use some of the profits for personal expenses and to expand my farm, for which I have unsuccessfully attempted to secure a bank loan due to bribery being a common practice. Despite having collateral support for my loan application, I was not approved due to not bribing the loan sanction officer. This culture of bribery lacks ethical considerations."	The participant expects higher milk production and profit this year and aims to use some earnings to expand the farm and for personal expenses. However, the participant has yet to obtain a bank loan for farm expansion because bribery is a cultural practice, even though the participant had collateral support for the loan application. This situation raises ethical concerns.	Sustainable Food Production	Corruption
ZIA	"I faced financial difficulties this year due to floods destroying my paddy and grass, which impacted my income compared to last year. To address this, I purchased cows and fed them grass, but high costs and uncleanness led to disease concerns. My cattle also suffered from a lack of balanced diet and low feedstock due to the natural disaster, such as over flood, downpour water, and uneven weather pattern."	This year, the participant faced financial difficulties from flood damage to paddy and grass, resulting in decreased income. Their solution of buying cows and feeding them grass incurred high costs and raised concerns about disease risks due to uncleanness. Help is needed for cattle diet, and feedstock is needed due to the impact of the natural disaster, including flooding, heavy rainfall, and erratic weather patterns.	Sustainable Food Production	Climate change

#### 4.9.4 Social entrepreneurship data structure and themes

All the participants emphasized the importance of creating job opportunities and providing sustainable employment to address poverty and unemployment in their communities, which are characteristics of social entrepreneurship. Table 4.5 illustrates data structure for social entrepreneurship.



**Table 4. 5 Data structure for social entrepreneurship** (output of phase 1 of data analysis)

Participants	1 <sup>st</sup> order quotes	Interpretation	Theoretical aspect	Categories
SYD	<p>“I work with sharecroppers to cultivate my land. To produce crops, I provide one bigha of land to the sharecropper, and in return, I get the first half of the harvest, while the sharecropper gets to keep the remaining produce. We both benefit from this arrangement, and I am happy with the results. Additionally, I have created job opportunities for members of my community who work on my cropland and cattle farm. My goal is to eliminate poverty and unemployment in my community by providing sustainable employment opportunities.”</p>	<p>The participant collaborates with sharecroppers, offering them one bigha of land for crop production while receiving the first half of the crops. This arrangement generates employment opportunities for the community, and the participant strives to combat poverty and unemployment by providing sustainable employment options.</p>	Social Entrepreneurship	Creating job
MIS	<p>“As a resident of a rural area, I have first-hand experience using DigiCow and Fosholi App, which have proven beneficial in agriculture. Farmers can achieve higher yields, reduce production costs, and minimize post-harvest losses by utilising these technologies. These innovations are part of the giant umbrella of farm-based technology, which includes precision agriculture, farm mechanization, crop diversification, and climate-smart agriculture.”</p>	<p>The participant, residing in a rural area, benefits from DigiCow and Fosholi App in agriculture, leading to increased yields and cost reduction. These technologies are part of a broader range of farm innovations, including precision agriculture, mechanization, crop diversification, and climate-smart practices. The participant advocates for leveraging farm-based technology to enhance agricultural productivity.</p>	Social Entrepreneurship	Introducing farm-based innovation & technology
SHA	<p>“To develop my farm, I need to diversify my sources of income. Currently, I cannot provide adequate support to my household or community. However, I can positively impact my family's well-being with additional income streams from sources such as</p>	<p>Recognizing the insufficiency of their current income, the participant aims to diversify income sources for farm development to support their household and community. Exploring biogas production and organic crop cultivation as new income streams seeks to enhance financial well-being and contribute to</p>	Social Entrepreneurship	Supporting community

	biogas production and organic crop cultivation. Additionally, by creating job opportunities and contributing to the development of my community, I plan to become a problem solver and a job creator. This will bring financial stability to my family and gain recognition and appreciation from the community.”	community development. By creating job opportunities and addressing community issues, the participant aspires to gain recognition, appreciation, and financial stability for their family.		
SEK	“As a social entrepreneur, I need to diversify my income streams, have access to finance, practice smart climate agriculture, and acquire sufficient knowledge and skills to strengthen my social safety nets. By doing so, I can contribute to building resilience in remote areas.”	The participant's statement suggests that a social entrepreneur needs multiple sources of income, financial support, expertise in smart climate agriculture, and enough knowledge and skills to improve social safety nets. The goal is to increase resilience in remote areas, which can refer to rural areas or less developed regions that lack adequate resources or infrastructure.	Social Entrepreneurship	Building resilience
MAL	“Being as a dairy and beef farmer and social entrepreneur in Bangladesh, I support sustainable development goals. I create local jobs and provide stable income, integrate new technologies for increased productivity, provide equal job opportunities, and promote sustainable farming practices. My goal is to inspire others to contribute to climate-smart agriculture practices.”	As a dairy and beef farmer and social entrepreneur in Bangladesh, the participant supports sustainable development goals by generating local jobs and stable income, employing new technologies for enhanced productivity and equal opportunities, and promoting sustainable farming practices. In addition, they aim to inspire others to adopt climate-smart agriculture and foster sustainable development.	Social Entrepreneurship	Supporting SDG

The integration of sustainable food production and social entrepreneurship to address food security is apparent in the data structure and themes presented in Tables 4.3, 4.4, and 4.5. Participants engaged in agriculture consistently face challenges such as low yield, scarcity, and the need for diversification in income sources. The emphasis on improving livestock health, combating climate change impacts, and addressing corruption for market access underscores the complexity of achieving food security and sustainable food production. Notably, participants adopt social entrepreneurship practices, creating job opportunities and

contributing to poverty reduction in their communities. The interconnected themes of yield improvement, climate-smart agriculture, and the commitment to Sustainable Development Goals (SDGs) highlight a comprehensive approach to agriculture that encompasses social, economic, and environmental dimensions. In this context, the pursuit of sustainable food production is inseparable from broader efforts in social entrepreneurship, reflecting a holistic understanding of the challenges and solutions in the agricultural landscape.

#### *4.9.5 Entrepreneurial ecosystem data structure and themes*

Table 4.6 presents data structure for the entrepreneurial ecosystem of Bangladesh.

Participants emphasized the importance of social and business networks for accessing resources, knowledge, and market opportunities. They also discussed the challenges associated with the loan application process through government banks or NGOs, including its complexity and time-consuming nature. Marketing channels and fair pricing are identified as ongoing challenges for entrepreneurs. The role of the government in providing services, training, and creating an enabling environment was recognized as crucial for entrepreneurship development. Participants acknowledged the impact of climate change on agricultural practices and the challenges it poses for farmers. Corruption is highlighted as a hindrance to entrepreneurial growth and success. Support from NGOs and donor organizations, including training programs, funding, and technical assistance, proved to be valuable for the participants. Access to artificial insemination and veterinary support was essential for livestock-based entrepreneurial activities. Lastly, participants mentioned the availability of microloans and training programs offered by different organizations to empower entrepreneurs and enhance their skills and knowledge.

**Table 4. 6 Data structure for entrepreneurial ecosystem** (output of phase 1 of data analysis)

Participants	1 <sup>st</sup> order quotes	Interpretation	Theoretical aspect	Categories
BEL	“As a dairy and beef farmer and social entrepreneur in Bangladesh, being involved in social and business networks can help me access resources, build relationships, and gain knowledge about the industry. By joining local farmer associations or cooperatives, participating in training programs or workshops, and connecting with other entrepreneurs or investors through business networks, I can gain valuable insights and resources to help grow my business and contribute to sustainable development goals.”	As a dairy and beef farmer and social entrepreneur in Bangladesh, the participant emphasizes the significance of engaging in social and business networks to access resources, build relationships, and acquire industry knowledge. Joining local farmer associations, attending training programs, and connecting with entrepreneurs and investors through business networks offer valuable insights and resources for business growth and contributions to sustainable development goals.	Entrepreneurial Ecosystem	Social and business networks
SEK	“To secure a loan for a new farm, I need to register at the Upazila Livestock Office and complete the loan application process. Registered with the Livestock Office as a dairy farmer offers the advantage of certification, allowing me to access loans from government banks at lower interest rates than other banks. Alternatively, I can apply for loans through NGOs as a new entrepreneur, which may require less collateral for entrepreneurship or SME loans but come with higher interest rates than conventional banks.”	To obtain a loan for a new farm in Bangladesh, the participant outlines registering at the Upazila Livestock Office and completing the loan application. Certified dairy farmers registered with the Livestock Office can access government bank loans at lower interest rates. Alternatively, new entrepreneurs can apply for loans through NGOs, which have lower collateral requirements but charge higher interest rates than traditional banks.	Entrepreneurial Ecosystem	Resource or Funding
MAL	“I receive a lower market price for my milk, but I can sell it easily. However, we are forced to sell our products at an illegally set price as there is no market monitoring system or opportunity for farmers to access the vertical marketing system. Furthermore, since milk is a perishable item, we cannot return it from the marketplace.	The dairy farmer needs help selling milk, citing lower market prices and a lack of market monitoring and vertical marketing channels. The perishable nature of milk and difficulties in product return are additional hurdles. The farmer deems selling a	Entrepreneurial Ecosystem	Marketing channels

	The current price for one litre of milk is 40 takas, which is not fair considering the high cost of dry feeds.”	litre of milk for 40 takas unfair, considering the high cost of dry feeds.		
DAS	“Accessing services solely through the livestock office can be challenging for a farmer. For rural dairy and beef farmers like me, doorstep services are essential. In addition, I require convenient access to training, knowledge, and skills for effective farm management and expansion. Regular training sessions organized by livestock officers empower farmers to develop their farms and contribute to the rural economy. However, the government office's paperwork-focused role may not always align with the practical needs and operations at the field level.”	The participant highlights challenges in accessing services from the livestock office, especially for rural farmers. They propose regular training sessions led by livestock officers to enhance farm development and contribute to the rural economy. The participant notes that the office's role is primarily paper-based and occasionally needs to be aligned with field-level operations.	Entrepreneurial Ecosystem	Role of government
MIN	“Being a dairy and beef farmer in Bangladesh, I witness first-hand the damaging effects of climate change. It diminishes feed production, causes water scarcity, increases pests and diseases, triggers extreme weather events, and threatens natural resources. These challenges profoundly impact my economic stability, hindering the management of feed, fodder, animal health, and the environment. Climate change poses an ongoing struggle, jeopardizing the long-term sustainability of our farming practices.”	Climate change poses significant challenges for dairy and beef farmers in Bangladesh, including reduced feed production, water scarcity, increased pests and diseases, extreme weather events, and threats to natural resources. These challenges hinder effective farm management, impacting feed, fodder, animal health, and the environment, thereby affecting economic stability.	Entrepreneurial Ecosystem	Climate change
UMF	“Based on my current knowledge, corruption in rural Bangladesh significantly negatively impacts dairy and beef farmers. Corruption hinders these farmers' access to critical resources and services, resulting in reduced productivity, increased production costs, and decreased profitability, ultimately affecting their livelihoods. Unfortunately, some farmers may feel forced to resort to bribery to obtain loans, but I always refuse to engage in unethical practices.”	Corruption negatively affects Bangladesh's rural dairy and beef farmers, decreasing productivity and profitability. Some farmers may feel compelled to resort to bribery for loans and resources, but the participant remains committed to ethical practices, refusing to engage in such behaviour.	Entrepreneurial Ecosystem	Corruption

VS-1	“Artificial insemination (AI) is being performed in Upazila, with one AI technician assigned to each Union, depending on its size. At the Upazila level, a K-F-A-I, a Deputy Assistant Livestock Officer, is responsible for creating artificial insemination. The AI process is performed on cows, and semen from two varieties is provided: Holstein Friesian and Sahiwal.”	The participant explains the artificial insemination process in Upazila, Bangladesh, involving AI technicians and a Deputy Assistant Livestock Officer. The process utilizes semen from Holstein Friesian and Sahiwal breeds, likely for a breeding program to enhance local livestock quality.	Entrepreneurial Ecosystem	Vet support
DLO-1	“Farmers in our country may need to be fully aware of the importance of training and may be reluctant to spend money on it themselves. To address this, the government has allocated a budget for a training program for farmers. The program invites farmers to attend training sessions at a government office. During the training, each farmer is given an allowance of Taka 200 and provided with lunch.”	The participant mentions a government-funded training program in an unspecified country to enhance farmers' skills and knowledge to improve their agricultural practices and livelihoods. Farmers are invited to attend training sessions at a government office, receiving an allowance of Taka 200 and lunch.	Entrepreneurial Ecosystem	Training
TMSS-1	Bangladesh's NGOs, government offices, and donor organizations collaborate to support milk and beef farmers by providing training, financial support, market access, and advocacy for policies that promote the sector's growth. These efforts aim to improve farmers' livelihoods and promote sustainable livestock development.	NGOs, government offices, and donor organizations collaborate to support milk and beef farmers in Bangladesh, fostering the growth of the livestock sector. Their joint efforts include training programs, financial support, market access facilitation, and policy advocacy to enhance farmers' livelihoods and promote sustainable livestock development.	Entrepreneurial Ecosystem	Collaboration
TMSS-2	"We also give Taka 1, 00,000 (NZD 1,499.32 @ 66.70) to those using microloans initially. Then, after that, I also issue a loan of 50 thousand takas. So, we have 5,000 customers to whom we have given loans to buy cows."	The participant mentions that their organization provides microloans to their customers, starting with Taka 1, 00,000 (NZD 1,499.32 @ 66.70) at the initial stage, and then they also provide loans of Taka 50 thousand. They have provided loans to 5,000 customers to buy cows.	Entrepreneurial Ecosystem	Finance

TMSS-2	<p>“We offer training programs to help our clients develop their skills and provide allowances and meals during the training sessions. While we do not directly provide veterinary services, we connect our customers with the Upazila Animal Resources Office for needed assistance. Additionally, we strongly partner with the Upazila DLO (Department of Livestock Office) to ensure prompt and efficient customer service.”</p>	<p>The participant's organization offers training programs, skill improvement, allowances, and meals. While they do not directly offer veterinary services, they connect clients with the Upazila Animal Resources Office for assistance. In addition, they maintain a strong partnership with the Upazila DLO to ensure efficient and timely customer service delivery.</p>	Entrepreneurial Ecosystem	Training
GB-1	<p>“Our mission is to eliminate poverty, so we provide loans to hardworking individuals who can improve their household income. First, we select borrowers who need working capital, start-up funding, feed, shed, and veterinary items. Then, we advise them to meet with an officer or veterinary doctor at the livestock office for further assistance.”</p>	<p>The participant's organization aims to alleviate poverty by offering loans to industrious individuals to enhance their household income. They identify borrowers needing working capital, start-up funds, and essential items such as feed, sheds, and veterinary supplies. They also recommend that borrowers consult with livestock office officers or veterinary doctors for additional support.</p>	Entrepreneurial Ecosystem	Finance
GB-1	<p>“I work as both a banker and a social worker. As a household leader, I listen to my loan borrowers, identify their problems, and help solve them. Additionally, I work on various issues, such as environmental concerns, health, hygiene, education, and food security, to promote the socio-economic development of my borrowers.”</p>	<p>The participant is an advisor to his loan borrowers, considering their financial, social, and economic conditions. He also guides on health, hygiene, education, and food security matters.</p>	Entrepreneurial Ecosystem	SDG's goal
YC-1	<p>"Our loan borrowers are considered our clients, and we do not require them to provide any collateral to obtain a loan for purchasing a dairy cow. Instead, the loan is processed through group activities, and each group consists of five individuals. One member is appointed as the group leader, who leads the group."</p>	<p>The participant suggests that the organization considers its loan borrowers as clients and offers loans without the need for collateral to purchase dairy cows. The loan process operates through group activities, and each group consists of five members, with one of them appointed as the group leader.</p>	Entrepreneurial Ecosystem	Finance

YC-1	"We currently have 500 dairy farmers in our project and conduct monthly visits to monitor their progress. In addition, we utilize online networking to check on our dairy project when physical visits are impossible. We also provide valuable training and support to our loan borrowers through cooperation and collaboration."	The participant's project supports 500 dairy farmers through regular visits and online monitoring—their cooperative offers loan borrowers training, networking, collaboration opportunities, and support.	Entrepreneurial Ecosystem	Training, networking, and collaboration
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One interesting theme across the key analyzed concepts is the relationship between geo-climatic conditions and food security. Adverse geo-climatic conditions harm agricultural productivity and the availability of sufficient and nutritious food resources, thereby jeopardizing food security. This theme emphasizes integrating sustainable food production and social entrepreneurship as complementary strategies to address food insecurity.

Leveraging the strengths and synergies of both approaches can help the farmers to create sustainable, equitable, and resilient food systems that ensure food security.

Furthermore, the participants acknowledge that supportive entrepreneurial ecosystem can foster the growth of social entrepreneurship. A supportive entrepreneurial ecosystem can enhance sustainable food production and social entrepreneurship initiatives, contributing to overall food security. There is a clear interlink between sustainable food production, social entrepreneurship, poverty reduction, and the role of the entrepreneurial ecosystem in addressing food security and promoting sustainable development.

#### 4.10 Chapter summary

This chapter consolidates multiple passages on qualitative research, emphasizing its significance in exploring issues involving unknown variables, such as people's perceptions, opinions, beliefs, and attitudes. It underscores the importance of comprehending the distinctions between quantitative and qualitative research methods. This chapter highlights the researcher's role, the subject's relationships, and the pros and cons of diverse data collection techniques, including face-to-face interviews, zoom interviews, and group methods. This chapter also addresses data collection challenges during the COVID-19 pandemic and underscores the importance of reflexivity in qualitative research, particularly in collecting field notes and conducting thematic analysis. Lastly, the chapter outlines a research study conducted in Bangladesh on food security and sustainable food production practices, outlining the research process and the data collection methods.



## **CHAPTER FIVE**

### **FINDINGS**

This chapter focuses on the analysis of the data collected, examining it within the framework of the proposed research model. It begins by providing an overview of the current state of food security in Bangladesh, explicitly highlighting the challenges milk and beef farmers face in specific regions. The importance of sustainable production practices is emphasized, and key factors influencing production are identified, such as access to finance, business support, and training opportunities. The analysis uncovers several barriers small-scale farming faces. These include policy and legislative barriers, corruption risks, and geo-climatic conditions.

#### **5.1 The current state of food security in Bangladesh**

Food security is a pressing issue in developing countries particularly for low and middle-income individuals (BBS, 2021). As of September 2021, Bangladesh ranked among the largest milk-producing nations in South Asia, producing approximately 9.2 million metric tons of milk in the fiscal year 2020-2021. However, the country faced challenges meeting domestic demand due to population growth and evolving dietary preferences. Small-scale dairy farmers needed help accessing inputs, markets, and technology, hindering their productivity and milk quality. To address these challenges, the government and development partners implemented various initiatives to promote dairy development. These initiatives included improving access to credit, providing training and extension services, and establishing milk collection centers and processing facilities.

As of September 2021, Bangladesh has a small-scale beef industry sector predominantly led by subsistence-level farmers. The country encountered obstacles such as limited access to modern technology, inadequate veterinary services, and a need for more organized markets. Cultural and religious factors also significantly influenced beef consumption and production. The government undertook several initiatives to enhance the industry, including promoting artificial insemination, offering training and extension services, and establishing new slaughterhouses and meat processing facilities. According to the USDA, Bangladesh produced an estimated 2.2 million metric tons of beef and buffalo meat in 2020 (USDA, 2021).

These statistics demonstrate the significance of Bangladesh's dairy and beef sectors and highlight the challenges small-scale farmers face in improving productivity, accessing markets, and adopting modern practices. The government and development partners have taken proactive steps to address these issues and promote sustainable growth in the dairy and beef industries. Table 5.1, sourced from the Bangladesh Bureau of Statistics (BBS) for 2019, provides insightful data on the demand, production, deficiency, and availability of milk and meat in Bangladesh. The statistics reveal the disparities between demand and production levels.

**Table 5.1 Milk and meat production capacity 2019**

Products	Demand	Production	Deficiency	Availability	Deficiency/Surplus ml/day/head
Milk	15.02 million metric ton (250 ml/day/head)	9.40 million metric ton	5.62 million metric ton	158.19 (ml/day/head)	91.81 ml/day/head
Meat	7.21 million metric ton (120 gm/day/head)	7.26 million Metric Ton	Surplus 0.046 million Metric Ton	122.10 (gm/day/head)	2.10 gm/day/head (surplus)

Source: BBS, 2019<sup>8</sup>

As the data shows, the 2019 demand for milk in Bangladesh was 15.02 million metric tons, with an average daily demand of 250 ml per person. However, the actual milk production was only 9.40 million metric tons, resulting in a deficiency of 5.62 million metric tons or a daily deficiency of 158.19 ml per person. This significant shortfall in milk production indicates a substantial gap between consumer demand and the available supply.

In contrast, the demand for meat in Bangladesh was 7.21 million metric tons, with an average daily demand of 120 grams per person. Surprisingly, meat production exceeded the demand, reaching 7.26 million metric tons. This resulted in a surplus of 0.046 million metric tons or a daily surplus of 2.10 grams per person.

These figures show the challenges faced by Bangladesh's population, which sits at 173,073,371 as of 26 July 2023<sup>9</sup>. This indicates an essential deficiency in milk production,

<sup>8</sup> Note. From "Bangladesh Bureau of Statistics," by BBS, 2019, *Bangladesh Bureau of Statistics by BBS*. ([http://bbs.portal.gov.bd/sites/default/files/files/bbs.portal.gov.bd/page/a1d32f13\\_8553\\_44f1\\_92e6\\_8ff80a4ff82e/Bangladesh%20Statistics-2019.pdf](http://bbs.portal.gov.bd/sites/default/files/files/bbs.portal.gov.bd/page/a1d32f13_8553_44f1_92e6_8ff80a4ff82e/Bangladesh%20Statistics-2019.pdf))

<sup>9</sup> <https://www.worldometers.info/world-population/bangladesh-population/>

potentially leading to vitamin and mineral deficiencies among rural populations and contributing to household food insecurity, as highlighted in a report by the Livestock Economics Section, DLS (2018).

Table 5.2, sourced from the Bangladesh Bureau of Statistics (BBS) for the fiscal year 2019-2020, provides valuable insights into the demand, production, deficiency, and availability of two vital food products: milk and meat. This table presents a snapshot of the data for the specific period mentioned.

**Table 5.2 Milk and meat production capacity 2020**

Products	Demand	Production	Deficiency	Availability	Deficiency/Surplus ml/day/head
Milk	15.66 million metric ton (250 ml/day/head)	11.98 million metric ton	3.68 million metric ton	175.63 ml/day/head	74.37 ml/day/head
Meat	7.52 million metric ton (120 gm/day/head)	8.44 million metric Ton	Surplus 0.92 million metric Ton	126.20 gm/day/head	6.20 gm/day/head (surplus)

*Source: BBS, 2020<sup>10</sup>*

As Table 5.2 shows, the 2020 demand for milk in Bangladesh was 15.66 million metric tons, with an average daily demand of 250 ml per person. However, the actual milk production was only 11.98 million metric tons, resulting in a 3.68 million metric tons deficiency. This deficiency translates to a daily shortage of approximately 175.63 ml per person (compared to 158.19 in 2019). These figures indicate an increasing gap between the demand for milk and the actual production, suggesting potential challenges in meeting the population's milk requirements.

In contrast, the table reveals that the demand for meat during the same period was 7.52 million metric tons, with an average daily demand of 120 grams per person. Surprisingly, meat production exceeded the demand, reaching 8.44 million metric tons. This resulted in a surplus of 0.92 million metric tons or a daily surplus of approximately 6.20 grams per person. However, it is essential to consider the limitations of Table 5.2, as it provides data specifically for the fiscal year 2019-2020 and does not capture long-term trends or patterns.

<sup>10</sup> Note. From “Bangladesh Bureau of Statistics,” by BBS, 2020, *Bangladesh Bureau of Statistics by BBS*. ([https://bbs.portal.gov.bd/sites/default/files/files/bbs.portal.gov.bd/page/a1d32f13\\_8553\\_44f1\\_92e6\\_8ff80a4ff82e/2021-05-14-06-22-47723b0e1476ed905d1c121f8f07d935.pdf](https://bbs.portal.gov.bd/sites/default/files/files/bbs.portal.gov.bd/page/a1d32f13_8553_44f1_92e6_8ff80a4ff82e/2021-05-14-06-22-47723b0e1476ed905d1c121f8f07d935.pdf))

Additionally, the data indicates a concerning trend in the milk industry, with an increase in deficiency over time due to population growth and decrease in milk production during the specified fiscal year.

Table 5.3 from the Bangladesh Bureau of Statistics (BBS) for 2021, provides vital information on the demand, production, deficiency, and availability of two crucial food products: milk and meat. The table presents a snapshot for the year. The 2021 demand for milk in Bangladesh was 15.66 million metric tons, with an average daily demand of 250 ml per person. However, the actual milk production amounted to only 13.07 million metric tons, resulting in a 2.59 million metric tons deficiency. This deficiency equates to a daily shortage of approximately 208.61 ml per person. These figures indicate a persistent gap between the demand for milk and its actual production, indicating challenges in meeting the population's milk requirements.

**Table 5.3 Milk and meat production capacity 2021**

Products	Demand	Production	Deficiency	Availability	Deficiency/Surplus ml/day/head
Milk	15.66 million metric ton (250 ml/day/head)	13.07 million metric ton	2.59 million metric ton	208.61 (ml/day/head)	41.39 ml/day/head
Meat	7.52 million metric ton (120 gm/day/head)	9.26 million metric Ton	Surplus 1.74 million metric Ton	147.84 (gm/day/head)	27.84 gm/day/head (surplus)

*Source: BBS, 2021<sup>11</sup>*

In contrast, the table reveals that the demand for meat during the same year was 7.52 million metric tons, with an average daily demand of 120 grams per person. Surprisingly, meat production surpassed the demand, reaching 9.26 million metric tons. This resulted in a surplus of 1.74 million metric tons, equivalent to a daily surplus of approximately 27.84 grams per person. The data shows a persistent deficiency in milk production and the surplus in meat production observed in 2021. These trends indicate the need for strategies to bridge the gap in milk production and optimize meat production to align with demand.

<sup>11</sup> Note. From “Bangladesh Bureau of Statistics,” by BBS, 2021-22; P denotes Provisional; “Livestock Economy,” Prepared by Dr. Hossan Md. Salim, Planning Section, *Department of Livestock Services (DLS)* ([http://dls.portal.gov.bd/sites/default/files/files/dls.portal.gov.bd/page/ee5f4621\\_fa3a\\_40ac\\_8bd9\\_898fb8ee4700/2022-07-18-03-43-37d18965a6458cda3c542ab146480962.pdf](http://dls.portal.gov.bd/sites/default/files/files/dls.portal.gov.bd/page/ee5f4621_fa3a_40ac_8bd9_898fb8ee4700/2022-07-18-03-43-37d18965a6458cda3c542ab146480962.pdf))

Additionally, the Livestock Economics Section of the Department of Livestock Services (DLS) reports a milk deficiency of 41.39 ml per day per person, particularly highlighting the vulnerability of individuals residing in rural areas to vitamin and mineral deficiencies. This situation contributes to Bangladesh's individual, community, and regional household food insecurity.

In addition to these reports, our primary data shows that farmers have made progress in enhancing food security in certain areas over the past five years. However, there are also areas where food security remains poor or shows negative trends, as demonstrated in Tables 5.4 and 5.5 below. In attempting to present the current state of food security in the northern and southern parts of Bangladesh, these two tables show the participants' perception and experience of the food security situation in their region.

Table 5.4 specifically captures some of the positive or negative indicative experiences of the participants that lead to their evaluation of the food security situation. Table 5.5 provides a comprehensive analysis of the roles played by the government, NGOs, and private organizations in enhancing food security under both favorable and challenging conditions. The table identifies five critical areas of intervention crucial to addressing food security namely: *access to finance, livestock breeding, training/business support, market linkages, and the influence of climate conditions*. Each area is examined in detail, outlining the actions and strategies implemented by the respective stakeholders and how these efforts contribute to overall food security outcomes. Moreover, Table 5.5 compares food security conditions across various Upazilas (sub-districts) in Bangladesh. These comparisons highlight the existing disparities and underscore the importance of tailoring interventions to suit the specific needs of each region.

The table also emphasizes the presence of corruption and political biases within each area and highlights their potential impact on the effectiveness of interventions. This recognition sheds light on the complex dynamics involved in addressing food security thus offering valuable insights into the challenges faced by different stakeholders. Overall, Table 5.5 provides a holistic overview of the roles, strategies, and challenges different stakeholders face in tackling food security in Bangladesh. By examining successes and limitations, the table presents a better understanding of the factors influencing food security and facilitates the formulation of more targeted and effective interventions for each context.

**Table 5.4 Participants' statements on current food security**

Food security in good condition					Food security in poor/negative condition			
Key Themes/Category	Farmers	DLS (DLO)	NGOs	Private org.	Farmers	DLS (DLO)	NGOs	Private org.
Access to finance	"I took my initial funding from my father to start up my farm." ASA, GOB-1	"We usually train for three days. After that, we link our train-up farmers to an agricultural bank. We advise them if they need any loans." VS-1	I work as a banker and social worker. I advise my loan borrowers as a leader of the household. I listen to identify and solve their financial problem." GB-1	"We gave them microloan at the initial stage. The amount of loan was Taka 20 thousand to Taka 50 thousand." YC-1	"The local government bank is highly corrupt. I have to bribe to secure any bank loan. They charge a percentage of the bank loan. I have to pay them in advance before they issue any loan. NGOs are available here, but they charge more than 20% interest on a loan." SAL, Shib-1	"Initially, farmers are not qualified for agriculture loans as the agriculture bank has to follow the legislative issue. It is a challenge for farmers." DLO-1	"We approve the loan within a week. I first see what the source of income is. If the source of income is acceptable, then I have no problem issuing a loan." TMSS-2	"The loan is processed based on group activities. There are five people in the group. One person is a group leader who leads the group. If there is any defaulter, none of the group members will be qualified for any loan." YC-1
Livestock breeding (Good breeding)	"I have not developed a good breed. I have indigenous varies that produce a low yield of milk. Dairy farms never lose if good breeds of cows are available on the farm." JEW, GOB-1	"We give semen of the Holstein Friesian variety, and we have semen for Sahiwal. We provide two types of semen." VS-1	"We have no direct veterinary service. If any of our customers have any problems, we contact the Upazila Animal Resources Office. We have a good relationship with DLO (Department of livestock office). This way, we ensure fast service to our farmers." TMSS-2	"For the technical support and services, we provide veterinary doctors." YC-1	"I have not developed a good breed. I have indigenous varies that produce a low yield of milk. Dairy farms never lose if good breeds of cows are available on the farm." JEW, GOB-1	"We have the same problem with artificial insemination. We have huge demand but less stock of semen. We have only two varieties such as Holstein Friesian and Sahiwal breed." VS-1	"We have no direct veterinary or AI (artificial insemination) services. If any of our customers have any problems, we connect ourselves to the Upazila Animal Resources Office." TMSS-2	"The government has a shortage of vaccines and AI (Artificial Insemination) support. The private organization charges a high rate for their services. We depend on their services. We do not provide AI services directly." YC-1
Training/Business support	"I am working to operate a dairy cooperative. The collective action can benefit the rural people (farmers) in a training program, upstream and downstream of the	"Farmers in our country are not so aware. They will not take training by spending money on themselves. We have the government budget; in fact, so	"Also, we have an institutional training team. They schedule training 1-2 times a year. I have a few officers in the branch; they list these things. In this system, we train our farmers." TMSS-1	"In addition, we provide training programs, services, and credit facilities." YC-1	"There is a syndicate of some wholesalers in the market, and it will be there. There is no monitoring in a supportive way from the government. So, the fair price for this is somewhat lower, and	"It is our list of 75 people. We will send this list to Dhaka in 2-1 days. If it passes, the budget is we will train them. They will get training for three days. There will be two types of theory and practical teachings. We show	"We provide loans considering everything after visiting the farm, but we do not require any land deposit documents from our farmers as collateral. When we consider a farm, we first see how its resources are. Then, we	"To operate this Grameen-Danone Foods Ltd., we need a certain quantity of milk annually. It is the reason that we have an annual target to purchase milk from dairy

	supply chain. It is necessary for the dairy holder." JEWS, Shib-1	we invited them to the office. We bring them and train them. And per head, they were given an allowance of Taka 200 and lunch." DLO-1	"We have training schemes, and we run training programs to develop their skills. In addition, we provide allowances and meals to farmers during training." TMSS-2		farmers are not making a profit." SAL, Shib-1	practically what kind of food to feed and prepare the food. Still, we have a bureaucratic process, and we have a limitation for trainees. We have limited seat capacity." VS-1	look at acceptance in society and involvement with any police case or criminal issues. Still, we have limitations in providing our endless support. It is our legislative issue." TMSS-2	farmers. We are based on Bogra zones only." YC-1
Market linkages	"I take my cattle and sell them in the market. So, it is convenient for me to sell my cattle at the local market." FIR, GOB-1	"So, we will be able to export halal meat within one or two years. But, of course, exporting will further increase the price of our beef, and farmers will get benefits, make more money, and create more jobs locally." VS-1	"I found that farmers did not face financial crises as they had daily cash flows during the cultivation and harvesting season. Through networking and market linkages, they receive a fair price for their milk production within our loan borrowers." TMSS-2	"We have daily demand to run Grameen-Danone Foods Ltd. We, therefore, allow our loan borrowers to sell their milk at this food factory at a fair price of their milk." YC-1	"I do not get a fair price for my milk, which affects production and income for the household." MAL, Bor-1	"I do not have a shortage of milk production, but we cannot pay a fair price for the products produced by the farmers due to poor market linkages and infrastructure." DLO-1	"My farmers sell their milk production to BRAC's milk collection points. It is another NGO. We want to help our farmers to run a dairy co-operative. We struggle to create a dairy co-operative at the moment." TMSS-2	"We have a selected area in Bogra District. We have 500 milk and beef farmers. We have a limitation for market linkage." YC-1
Corruption	"I do not need to bribe anybody as it depends on a good relationship and networking to take a loan from the government bank." MIN, Shib-1	"Milk costs much less than feed costs. It is 40 katas a liter. The farmers are forced to sell milk at such a low price. The reason is the consumers' crisis, but there is no corruption in the milk market, or there is no busyness syndicate. Lack of awareness among those who are	"We have to disburse loans to at least five farms every month as per our target. We are not involved with any corruption to disburse any agriculture loan as the NGOs rules." TMSS-2	"We gave them microloan at the initial stage. The amount of the loan was Taka 20 thousand to Taka 50 thousand. Therefore, there is no corruption or bribe	"Milk vita (milk cooperative) is corrupted, and people engaged politically, and members of milk vita are not benefitted." SHA, GOB-1	"Legally and illegally, people used to bring cattle from neighbouring countries due to the high level of corruption in the border areas. Now the cows do not come officially from India." DLO1	"For the selection process, we look at the acceptance of farmers in society and their involvement with any police case or criminal issues. We are not involved with any corruption. We operate our activities under certain conditions of the NGO bureau. Still, we have limitations in providing our endless support due to legislative issues." TMSS-2	"It is not corruption, but I do not have enough freedom to work closely with rural farmers. I have explained this problem to the director of Yunus Centre." YC-1

		composition." DLO-1		issue to disburse any credit among our loan borrowers." YC-1				
Climate conditions	<p>“Now the climate challenge is a big challenge for milk and beef farmers. Their challenge comes ultimately to me. I cannot recover from natural calamity even if I want to help them. A natural disaster is not in my hand.” VS-1</p>				<p>“My challenge is that when there is a natural calamity, especially floods, it is suddenly seen that the grassland sinks. Then the farmers suffered from food shortage (cattle feed), which impacted their farms and income sources.” DLO-1</p>			



**Table 5.5 The role of the government, NGOs, and private Org.**

A = Good condition of food security						B = Not good condition of food security					
S/N		DLS (DLO)	NGOs/Private org.	Farmers	Corruption	S/N		DLS (DLO)	NGOs/Private org.	Farmers	Corruption
1	Access to finance	Issue loan recommendation letters	Provide credit facilities	Access to credit without collateral	Less corruption and political involvement	1	Access to finance	Issue loan recommendation letters	Seek land documents as collateral	Access to credit with term and conditions	Corruption and political biasness
2	Livestock breeding	High yield/production a) Holstein Friesian b) Sahiwal	Cross breeding- a) Brahman b) Jersey c) Holstein Friesian d) Sahiwal e) Red Chittagong Cattle f) Red Sindhi g) Tharparkar	Purchase from the DLO and private organizations	Insignificant corruption	2	Livestock breeding	High yield/production a) Holstein Friesian b) Sahiwal	Cross breeding- a) Brahman b) Jersey c) Holstein Friesian d) Sahiwal e) Red Chittagong Cattle f) Red Sindhi g) Tharparkar	Use indigenous varieties rather than high yield varieties	Bribing issues involve
3	Training/Business support	DLS (DLO)-75 farmers/year (capacity)	NGOs/Private Org.- provide a short-term training program	Attend for a short-term training program	Less political biasness	3	Training/Business support	DLS (DLO)-75 farmers/year (capacity)	NGOs/Private Org.- Less often offering a short term program	Less interested in attending the training program	Corruption and political biasness
4	Market linkages	Govt. Infrastructure- a) Regulation b) Monitoring c) Technology	a) Market collaboration b) Community linkage c) Group member linkage	Less struggle to sell	Less referral engagement	4	Market linkages	Govt. Infrastructure- a) Regulation b) Monitoring c) Technology	Less linkages or collaboration	More struggle to sell	More referral engagement
5	An effect of climate conditions	Less flood and monsoon affected area				5	An effect of climate conditions	More flood and monsoon affected area			

### 5.1.1 Availability

According to the Food and Agriculture Organization (FAO) in Bangladesh, the Integrated Food Security Phase Classification (IPC) has identified that 40.77 million people, out of the country's total population of 171 million, are facing undernourishment. This alarming statistic underscores the urgent need to ensure access to sufficient, nutritious, and safe food for a large portion of the population, enabling them to lead active and healthy lives. Addressing the issue of food availability is a crucial aspect of improving overall food security in the country. Table 5.6 illustrates the various phases categorizing the food availability status per the IPC 2022. This classification system helps to monitor and assess the severity of food security situations in different areas, enabling targeted interventions and strategies to be implemented accordingly. By focusing on improving food availability, it becomes possible to address the underlying causes of undernourishment and ensure a more sustainable and secure food future for the people of Bangladesh.

*“As a committed government officer, I prioritize enhancing food availability in my region with technology-driven initiatives, focusing on boosting milk and meat production in targeted areas. Our early implementation of DigiCow and Fosholi Apps shows promising potential for improving agricultural practices and securing a steady supply of these essential food items.” DLO-2, Shib-1*

Table 5.6 illustrates the distribution of chronic food insecurity across different levels, shedding light on the magnitude of the issue and its impact on the population.

**Table 5.6 Integrated Food Security Phase Classification (IPC)), Government data**

S/N	Population	Percentage of total population	Status of availability	IPC level
1	69.8 million	43%	No Chronic Food Insecurity	1
2	58.5 million	36%	Mild Chronic Food Insecurity	2
3	23.1 million	14%	Severe Chronic Food Insecurity	3
4	11.7 million	7%	Severe Chronic Food Insecurity	4

Source: IPC, 2022<sup>12</sup>

<sup>12</sup> Note. From "Integrated Food Security Phase Classification," by IPC, 2022, *Integrated Food Security*. (<https://www.ipcinfo.org/ipc-country-analysis/details-map/en/c/1155697/?iso3=BGD>)

The data reveals that although 43% of the total population in Bangladesh (equivalent to 69.8 million people) do not experience chronic food insecurity (Level 1) 36% (approximately 58.5 million) suffer from mild chronic food insecurity (Level 2). Additionally, 14% of the population, comprising 23.1 million people, face severe chronic food insecurity at Level 3, while 7% of the population (11.7 million), and experience the highest level of chronic food insecurity at Level 4.

These findings underscore the critical need for effective interventions and targeted strategies to address chronic food insecurity and alleviate its impact on vulnerable populations. It is essential to recognize that food availability varies across the different IPC levels and is influenced by factors such as geographical location, government support, and the involvement of NGOs and private organizations.

*"My target in Gobindaganj Upazila is to achieve 20,000 metric tons of milk, 18,000 tons of meat, and four crore eggs annually. Aligned with the fiscal year 2020-2021, the Annual Performance Agreement with the government sets these targets for each Upazila, and I am committed to meeting them."* DLO-1, Gob

*"The record shows 95% of farmers have improved their milk production due to crossbreeding, quality feed, and training programs. However, 5% of dairy farmers have no improvement in milk production. They have a poor quality of feed and management."* YC

The Global Food Security Index (GFSI) is a comprehensive assessment offering a global food security perspective. The index assesses various categories, including affordability, availability, quality and safety, and natural resources and resilience, to evaluate food security across 113 countries. By highlighting the strengths and weaknesses of food systems, the GFSI assists policymakers and stakeholders in identifying areas that require improvement. The Global Food Security Index 2021 ranks Bangladesh 84th out of 113 countries in food security. The country received an overall score of 49.1 out of 100. Table 5.7 displays the indicator scores, which assess a country's food security status. The scores for Bangladesh are as follows: 48.8 for Affordability, 58.1 for Availability, 45.5 for Quality and Safety, and 36.8 for Natural Resources and Resilience.

**Table 5.7 Global Food Security Index 2021**

Country rank	Indicators	Score out of 100
84 out of 113	Availability	58.1
	Affordability	48.8
	Quality and safety	45.5
	Natural resources and resilience	36.8

Source: GFSI, 2021<sup>13</sup>

The individual indicator scores reveal that a considerable portion of the country's population faces food insecurity. Table 5.7 indicates that Bangladesh has a long way to go to attain food security. This highlights the pressing need to implement strategies to improve food access and strengthen the overall food system (FSI, 2021).

In comparison to the global index, the study's primary data (from government offices, NGOs, and private organizations) at the Upazila level reveal a significant rise in milk and meat production in metric tons for 2019-2020 (see table 5.8).

**Table 5.8 Milk and meat production in metric tons for 2019-2020**

Case No	Code of govt. office, NGO, and private org.	Forecast of sustainable milk production (Metric tons)- 2019-2020	Forecast of sustainable beef production (Metric tons)- 2019-2020	Actual milk production (Metric tons) 2019-2020	Actual beef production (Metric tons) 2019-2020	Total milk production (Metric tons) in % in 2019-2020	Annual shortage/surplus of milk production in % in 2019-2020	Total beef production (Metric tons) in % in 2019-2020	Annual shortage/surplus of beef production in % in 2019-2020
DLO-1	DLO-1, Gob	31130	15,558	20758	18810	66.68165757	-33.31834243	120.9024296	20.90242962
DLO-2	DLO-2, Shib	12187.5	9208.33	13937.5	9845.83	114.3589744	14.35897436	106.9230794	6.923079429
DLO-3	DLO-3, Bur	8922.5	11286.95	9222.84	10502.4	103.3660969	3.366096946	93.04905222	-6.950947776
YC-1	YC	10515.12	5722.09	10780.12	5580.53	102.5201805	2.520180464	97.52607876	-2.473921242
TMS S-1	TMSS	4166.66	1276.04	4320.12	1250.5	103.6830459	3.683045893	97.99849534	-2.001504655
TMS S-2	TMSS	4320.02	1339.09	4080.01	1520.2	94.44423868	-5.555761316	113.5248564	13.52485643
GB-1	GB	4280.07	1480.5	4467.15	1580.78	104.3709565	4.37095655	106.7733874	6.773387369

This data incorporates inputs from government agencies, non-governmental organizations (NGOs), and private entities which contribute to food availability. Table 5.8 presents data on

<sup>13</sup> Note. "From Global Food Security," by GFSI, 2021, *Global Food Security Index by Security*. (<https://impact.economist.com/sustainability/project/food-security-index/Index>)

the forecast of milk production in metric tons for 2019-2020. It provides valuable information on the annual shortage and surplus of milk and beef production among milk and beef farmers.

The table demonstrates that despite the rise in production levels, there is still a substantial shortage of milk production in the Gobindagonj and Shibgonj Upazilas. The scarcity of milk production in these areas highlights the need for assistance to help farmers meet their milk production needs.

In the preceding sections, Tables 5.6 and 5.7 provided an overview of food security in Bangladesh, while Table 5.8 focused specifically on milk and beef production. These three tables paint a distressing picture of the current state of food security in Bangladesh, with nearly half of the population facing food insecurity. The low crisis level score of 3.03 out of 10 further underscores the severity of the situation, indicating insufficient access to food. Analyzing both indexes underscores the vital importance of examining individual indicators to gain a comprehensive understanding of the food security challenges confronted by Bangladesh (GFSI, 2022).

A more specific look at the milk and beef production of two regions, DLO-2, and DLO-3, for 2019 and 2020 highlights the potential implications for food security in the two regions. Table 5.9 compares the production levels. In 2019, DLO-2 had a higher milk production of 114.358 units compared to DLO-3's production of 102.865 units. Similarly, DLO-2 outperformed DLO-3 in beef production, with 106.923 units compared to DLO-3's 93.049 units. This represents a 11.49% difference in milk production and a 13.87% difference in beef production between the two regions. These suggest that DLO-2 has a more productive agricultural system regarding milk and beef production than DLO-3.

**Table 5.9      Production comparison- DLO-2 vs. DLO-3 (2019-2020)**

Production	DLO-2	DLO-3	Production in %	Govt.
Milk production	114.358	102.865	11.49%	DLO-2
Beef production	106.923	93.049	13.87%	DLO-2

This information can be valuable for the government in allocating resources and implementing measures to enhance production in DLO-3. By improving production in DLO-

3, the government can ensure food security and equitable access to milk and beef in both regions.

The findings reaffirm the importance of sustainable production to enhance food availability for farmers as the following quotes illustrate.

*"I am committed to sustainable practices to enhance food availability and support farmers. We have records reinforcing the importance of equitable access to milk and beef production, inspiring me to advocate for resource allocation and initiatives to enhance production for the specific reason."* DLO-3.

*"I emphasize to farmers the importance of fattening cows for better outcomes. I encourage them to seek advice from the Upazila Livestock Office to benefit from improved breeding practices and providing high-quality feed, as production significantly depends on breeding quality."* TMSS-1

*"As milk consumption rises, creating higher market demand, the milk price may increase by 10 takas per litre, benefiting farmers and fostering farm expansion. Moreover, increased milk availability may improve vitamin and mineral availability, contributing to better nutrition for consumers."* TMSS-2

Improved food availability can positively impact household food security and welfare indicators, such as household revenue, net income, expenses, and assets. It also contributes to reducing hunger, poverty, and unemployment within households.

#### 5.1.2 Access

Access to food is significantly impacted by affordability, and this is particularly evident in Bangladesh. The Food Security Index for 2021, gave Bangladesh a food affordability score of 48.8 out of 100, reflecting the level of affordability of food in the country. Furthermore, when considering the Global Hunger Index 2021 (which ranks countries based on various indicators related to hunger), Bangladesh is positioned 76th out of 116 countries. The country obtained a food affordability score of 19.1 out of 100, which is considered moderately higher than the global average score of 17.9 out of 100. This indicates that food affordability

remains a significant challenge in Bangladesh, as a considerable portion of the population faces difficulties accessing adequate and nutritious food.

The Global Hunger Index also considers factors such as the percentage of undernourished individuals and the prevalence of stunted children under five. These indicators provide crucial insights into the extent of hunger and malnutrition within the country. In the case of Bangladesh, the food affordability score of 19.1 places it in the "Extremely Alarming" category on the Hunger Index Security Scale. Highlighting the urgent need for targeted efforts to improve food access and affordability for the population. Table 5.10 shows that 9.7% of the population in Bangladesh is undernourished, indicating a significant proportion of people who do not have access to sufficient food. Additionally, 28% of children under five suffer from stunted growth, reflecting the impact of inadequate nutrition on child development. These figures highlight the challenges related to food security and malnutrition in Bangladesh.

**Table 5. 10 Global Hunger Index 2021** (Level of affordability)

S/N	Particulars	Current position	Score obtained	Hunger Index Security scale	
				Category	Score
1	Rank	76 <sup>th</sup> out of 116 countries		Low	≤ 9.9
2	Undernourishment	9.7% of population		Moderate	10.0-19.9
3	Stunted	28% under-5 children		Serious	20.0-34.9
4	Average score (global)		17.9	Alarming	35.0-49.9
5	Country's score (Bangladesh)		19.1	Extremely alarming	≥ 50

Source: GHI, 2021<sup>14</sup>

Based on the above data, Bangladesh has reached a moderate level of food security. A score between 10.0 and 19.9 out of 100 indicates this level. For instance, a score of 19.1 signifies that the country has achieved an affordability rate of 51.83%. However, it is essential to note that approximately 48.17% of the population still lacks good affordability, emphasizing the need for further efforts to improve food security.

The Global Food Security Index for Q2 of 2022, ranks Bangladesh 115th out of 171 countries, with an overall score of 10 based on three indicators: Access to Food, Crisis Level,

<sup>14</sup> Note. From "Global Hunger Index," by GHI, 2021, *Global Hunger Index by Severity*. (<https://www.globalhungerindex.org/bangladesh.html>)

and Food System and Economy Resilience. The country's scores are 5.19; 3.03; and 4.45 respectively as shown in Table 5.11. In 2022, the state of food security in Bangladesh remains the same, with almost half of the population facing food insecurity. The low crisis level score of 3.03 out of 10 highlights the severity of the crisis, confirming inadequate access to food. Natural disasters and human-made shocks adversely affect poverty levels, income disparity, and overall vulnerability, impacting individuals' access to food. To address these challenges, it becomes evident that the involvement of various stakeholders (such as smallholders, small businesses, petty trading, public-private partnerships, and enterprises) is crucial for improving the food system in both rural and urban areas.

**Table 5.11 Global Food Security Q2, 2022** (Food Security Index: 1st of July 2022)

Country rank (Bangladesh)	Pillars of food security	Score out of 10
115 out of 171	Access to food	5.19
	Food system and economy Resilience	4.45
	Crisis level	3.03
	Overall score	5.54

*Source: GFSI, 2022Q2<sup>15</sup>*

In the Global Food Security Index for Q2 2022, Bangladesh's standing is illuminated through four key pillars. The "Access to Food" pillar, scoring 5.19, evaluates the population's ability to secure an adequate and nutritious food supply. Assessing the resilience of the food system and economy, the "Food System and Economy Resilience" pillar scores 4.45, indicating the capacity to endure shocks and disruptions for a stable food supply. Reflecting the severity of crises, the "Crisis Level" pillar scores 3.03, spotlighting challenges in maintaining consistent food access, especially during adverse situations. The "Overall Score" of 5.54 is a comprehensive measure offering an overview of the country's state of food security.

Regardless of geographical location, enhancing access to the food market (particularly for fresh produce and nutritious diets) is vital for uplifting the conditions of the poor and vulnerable. Research findings underscore the repercussions of inefficient market access,

<sup>15</sup> Note. From "Global Food Security Index," by GFSI, 2022Q2, *Global Food Security Index*. (<https://impact.economist.com/sustainability/project/food-security-index/Index>)



leading to domestic product deficiencies, price fluctuations, and hindrance to food access in vulnerable areas. This scarcity of nutrition and resources compounds the challenge of accessing sufficient food and essential commodities. Recognizing access to food as a fundamental human right and necessity is crucial. Here, the government plays a pivotal role in ensuring continuous and ample access to the national food supply, particularly during crises and challenging agricultural situations. Access to food is not just fundamental to food security; it necessitates a comprehensive approach that considers the various interconnected elements demanding further exploration.

*"I prioritize safe meat processing, consumer protection, and health and hygiene. Collaborating with regulatory bodies, we mitigate risks related to antibiotic resistance and bacterial diseases while supporting farmers to enhance meat quality and adhere to the Consumer Protection Act, advancing our agricultural goals," emphasizes DLO-3.*

DLO-3's commitment to safe meat processing aligns with broader agricultural goals. This collaboration with regulatory bodies addresses risks related to antibiotic resistance and bacterial diseases and supports farmers in improving meat quality. Adherence to the Consumer Protection Act further underscores DLO-3's dedication to ensuring food safety and consumer well-being, contributing to the overall advancement of agricultural practices.

The COVID-19 pandemic has brought to the forefront the vital role local food economies play in ensuring food security. This crisis has underscored that the significance of local food systems extends beyond economic considerations, revealing their indispensable nature in times of global disruption. In Bangladesh, where the pandemic has left 20% of the population below the poverty line, the repercussions include unexpectedly high food prices and commodity costs, disproportionately affecting vulnerable groups.

Recognizing the severity of these challenges, the government has implemented safety net programs to support marginalized farmers, smallholders, those with limited resources, rural landless individuals, and the urban poor. These programs provide essential financial assistance and ensure access to food, serving as a crucial lifeline during these challenging times. Moreover, a concerted effort is to address the broader impact on food systems by enhancing resilience. Initiatives such as the National Agricultural Technology Project

(NATP) and the World Bank-funded Livestock and Dairy Development Project (LDDP) exemplify this commitment to building a more adaptable and robust food system.

*"With donor agency support, I am dedicated to implementing the National Agricultural Technology Project (NATP) and the World Bank-funded Livestock and Dairy Development Project (LDDP) in Bangladesh. "These initiatives aim to enhance food availability, promote agricultural technology adoption, and build resilience in the livestock and dairy sector for improved food security," says DLO-2, Shib-1.*

Crisis management is another pivotal aspect, and Bangladesh's government is taking significant steps to address food and nutrition security by implementing the National Food and Nutrition Security Policy. This ambitious plan aims to transform food systems to effectively meet the population's needs, particularly in the face of challenges posed by the COVID-19 pandemic. Priorities include sustainable development, protecting vulnerable communities, and leveraging technology and e-commerce platforms to facilitate trade and achieve Sustainable Development Goals. The pandemic has underscored the critical link between food security and crisis levels, emphasizing the need for resilient supply chains during challenging times.

In conclusion, the lessons learned from COVID-19 stress the importance of local food economies as a linchpin in ensuring food security. The government's multifaceted approach, supported by initiatives like NATP and LDDP, addresses immediate challenges and lays the foundation for sustained resilience and prosperity in the face of future crises.

### *5.1.3 Utilization*

As the third pillar of food security, utilization refers to the proper and effective food utilization by individuals, households, and communities. It ensures that food meets nutritional requirements and contributes to overall health and well-being. Utilization involves safe food handling, appropriate cooking methods, and equitable distribution of food resources to maximize the nutritional benefits and address malnutrition concerns. The National Micronutrient Survey conducted in 2011-2012 reveals a high prevalence of vitamin and mineral deficiencies in preschool- and school-age children and among women during early and late pregnancy.

Table 5.12 underscores the urgent need for effective interventions to address these nutritional challenges and highlights the vital role of food affordability in combating deficiencies among marginalized communities, particularly those with limited cattle ownership. Addressing food insecurity becomes crucial for individual and community well-being and the nation's overall welfare.

**Table 5. 12    Micronutrient Deficiency National Survey 2011-2012**

S/N	Indicator	Baseline year 2011-2012 (Children)	Target group	Baseline year 2011- 2012 (Women)	NPNL women (years)
1	Vitamin A deficiency	20.5%	Preschool-age children (6-59 months)		
2	Vitamin A deficiency	20.9%	School-age children (6-14 years)		
3	Iron deficiency	10.7%	Preschool-age children (6-59 months)		
4	Iodine deficiency	40%	School-age children (6-14 years)	42.1%	15-49
5	Zinc deficiency	44.6%	„	57.3%	„
6	Vitamin D deficiency	39.6%	Preschool-age children (6-59 months)	71.5%	„
7	Calcium deficiency	24.4%	„	26.3%	„
8	Vitamin B12			19%	Early Pregnancy period
9	Vitamin B12			38%	Late pregnancy period

*Source: Ahmed, Prendiville & Narayan, 2016<sup>16</sup>*

Based on this study's primary data (focusing on cattle ownership as an indicator of the food security scale) farmers with one or two cows experience higher vitamin A, iron, and zinc deficiencies, while farmers with three to four cows have limited access to nutritious food. This underscores the pressing need to address malnutrition. Participant VS-1 emphasizes the significant influence of cattle ownership on household food access in Gob. Meanwhile, as

<sup>16</sup> Note. From "Micronutrient deficiencies among children and women in Bangladesh: progress and challenges," by Ahmed, Prendiville, & Narayan, 2016, *Journal of nutritional science*. (<https://doi.org/10.1017/jns.2016.39>)

illustrated in Table 5.13, participant DLO-2 reveals that farmers with more cattle in the South are subsistence farmers with restricted access to milk and nutritious food.

**Table 5. 13 A cross-case analysis**

	Area	Food security	
<i>Government Data</i>	<i>North/South</i>	<i>Scale 1 to 5 or above (Number of cattle)</i>	Individual food security situation
VS-1, Gob Veterinary Service Officer, DLO-1	North	Scale: 1-2 cattle (marginalized), which impacts vitamins and minerals. a) Vitamin A deficiency: 18%-52% Iron deficiency: 11%-44% Zinc deficiency: 19%-45% (Source: Legumes) b) Good health: No c) Access to food nutrition: No d) Livestock insurance: No e) Home/Shelter: Yes	a) Farmers drink 109ml/person/day (Daily demand of milk: 250ml/person/day). b) Availability is 165.07/person/day. b) They consume low food nutrients (suffering from vitamin deficiency). c) They are struggling to have food security.
DLO-2, DLS Office, DLO-2	South	Scale: 3-4 cattle (subsistence) a) Enough food: Yes b) Good health: Yes c) Access to food nutrition: Limited d) Livestock insurance: No e) Home/Shelter: Yes	a) Farmers are not struggling to have food security. b) They consume a limited quantity of milk. c) They consume low food nutrients.

Other utilization factors contained in the Food Security Index for Bangladesh in 2021 are in Table 5.14 featuring scores, score changes, ranks, and rank changes for six food security indicators: Quality and Safety, Dietary Diversity and Nutritional Standards, Micronutrient Availability, Protein Quality, and Food Safety. In this index, Bangladesh has achieved the highest score in Nutritional Standards, with a perfect score of 100.0, placing it at the top among all countries. However, the country's performance is weakest in Dietary Diversity, with a score of 1.5, ranking 112th among all countries. There has been a slight improvement in Food Safety, with a score increase of 6.6 and a rank increase of four places compared to the previous year.

Despite this improvement, Bangladesh's overall Food Security Index score remains below the global average of 68.0. The country scores below average in all six indicators except for Nutritional Standards. Bangladesh's overall food quality and safety score is 45.5, indicating a moderate level. However, this score is 22.5 points lower than the average for all countries, represented by a negative sign and red color in the table.

**Table 5. 14 Food Security Index 2021**

	Series	Score	Change in score	Rank	Change in rank	Average score (all countries)	Bangladesh compared to average
	Quality and safety	45.5	+1.1	99	2	68.0	- 22.5
	Dietary diversity	1.5	0	= 112	-----	48.3	- 46.8
	Nutritional standards	100.0	0	= 1	-----	62.1	+ 37.9
	Micronutrient availability	33.7	0	112	-----	78.3	- 44.6
	Protein quality	37.4	0	= 102	-----	68.4	- 31.10
	Food safety	83.7	+ 6.6	68	4	80.1	+ 3.6

Source: GFSI, 2021<sup>17</sup>

Color indicates the status of indicators.

	Score 80-100 (very good)		Score 40-59.9 (moderate)		
	Score 60-79 (good)		Score 20-39.9 (weak)		Score: 0-19.9 (very weak)

The second indicator (dietary diversity) has a significantly low score of 1.5, highlighting its weakness compared to the global average score of 48.3. The third indicator (nutritional standards) excels with a national score of 100.0, surpassing the world average of 62.1. The fourth indicator (micronutrient availability) obtains a weak score of 33.7, while the average world score is 78.3. Similarly, the fifth indicator (protein quality) also receives a weak score of 37.4, in contrast to the global average score of 68.4. Lastly, the sixth indicator (food safety) demonstrates a score of 83.7, slightly higher than the average score of 80.1 for all countries.

These statistics provide valuable insights into Bangladesh's food security situation, revealing strengths and areas needing improvement. The data emphasizes the crucial role of addressing dietary diversity and ensuring sufficient availability of micronutrients to strengthen overall food security in the country, effectively tackling the issue of food utilization.

Further evidence is in The Daily Star Newspaper report on utilization. Table 5.15 underscores the importance of utilizing elements of food security, particularly food quality and safety, as essential components in Bangladesh. This crucial information is highlighted and detailed below:

<sup>17</sup> Note. "From Global Food Security Index," by GFSI, 2021, *Global Food Security Index by Severity*. (<https://impact.economist.com/sustainability/project/food-security-index/Index>)

**Table 5. 15    Report from the news media on utilization**

S/N	Particular	Score out of 100	The percentage of non-starch foods/safe drinking water/electricity for storing food safety
1	The quality food and safety score of Bangladesh	40.9	21%
2	Dietary energy consumption		52.4%
3	Access to safe drinking water		55.4%
4	Access to electricity for storing food safely		85.2%

*Source: The Daily Star, 2021<sup>18</sup>*

Table 5.15 provides an overview of four key indicators concerning food security in Bangladesh. The first indicator is the country's food quality and safety score, which stands at 40.9, indicating a low level of food safety. This score suggests that there are challenges in ensuring food safety in Bangladesh. The second indicator pertains to dietary energy consumption, which is 52.4%. This figure reflects the level of food consumption within the country. The third indicator focuses on access to safe drinking water, scoring 55.4%. This percentage highlights the portion of the population with access to clean drinking water, emphasizing the importance of clean water in ensuring food security. Lastly, the fourth indicator assesses access to electricity for adequate food storage, scoring at 85.2%. This figure signifies the proportion of households with electricity access, enabling them to preserve food effectively.

Maintaining food quality and safety is crucial in ensuring food security, as contaminated food can transmit diseases through harmful bacteria, viruses, parasites, or toxic chemicals. While certain regions in northern and southern Bangladesh exhibit sufficient crop production and sustainable dairy and meat production, minimizing food scarcity issues, there remains a risk of indiscriminate use of synthetic pesticides, chemical toxins, food additives, and preservatives. These practices pose significant threats to food quality and safety, as revealed in the transcripts of interviews with participants. Thus, it is essential to recognize the vital link between food security elements, nutrition, and food safety. Raw materials such as milk and meat are perishable items that can become contaminated due to poor handling, food

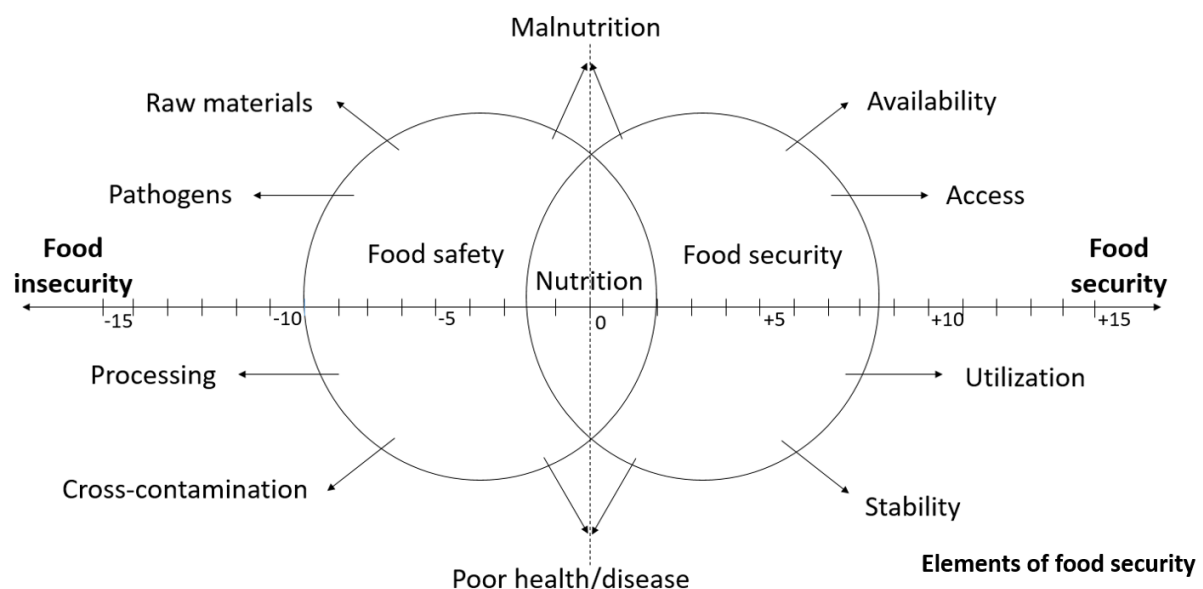
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<sup>18</sup> Note. "From Food Quality and Safety," by The Daily Star, 2021, *The Daily Star News Portal*. (<https://www.thedailystar.net/bangladesh/news/bangladesh-last-south-asia-according-global-food-security-index-2020-2052065>)

preparation, and storage practices. All these issues are related to food security, particularly concerning utilization.

*"Ensuring food safety, veterinary medicine, and control are vital aspects of my role. We issue licenses for dairy holders and vet suppliers and conduct inspections to maintain quality standards. Non-compliance may lead to legal actions, safeguarding animal and consumer well-being."* DLO-1

The discussion has meticulously unraveled the intricate dynamics of food security in Bangladesh, reaching a pivotal juncture where the role of the food safety regulatory body and consumer protection laws comes into sharp focus. The interviews with study participants unveil a bureaucratic landscape punctuated by challenges like corruption, complex chains of command, and protracted bureaucratic processes that hinder the efficacy of consumer protection laws. This critical analysis leads us to a profound realization: the efficacy of these laws is intricately tied to the accessibility of adequate, safe, and nutritious food, which is fundamental for fostering good health and sustaining a high quality of life. The discussion seamlessly transitions to Figure 5.1, a visual representation that masterfully encapsulates the interplay between food safety, nutrition, and food security.



**Figure 5.1 Food Safety, Nutrition and Food Security**

This figure employs a scale that vividly depicts the continuum from food insecurity (-15) to food security (+15), illustrating how improvements in one dimension positively impact the

others. The visual emphasizes that addressing food security involves navigating the complex interactions between food safety, nutrition, and access to a secure food supply. It serves as a compelling visual narrative, reinforcing the intersected nature of these elements and highlighting their profound implications for the well-being of individuals across different age groups. Ultimately, this figure serves as a visual anchor, encapsulating the essence of the discussion and providing a strategic vantage point for proposing targeted interventions to enhance food security in Bangladesh.

#### 5.1.4 Stability

The findings underscore that stability in food security is characterized by the continuous availability of adequate, safe, and nourishing food over time, with minimal fluctuations. These results highlight the pivotal role of dependable food production and supply, encompassing essential items like milk and meat, in securing sustained access to food. Moreover, the study reveals that fostering dietary diversity, economic well-being, and community resilience plays a crucial role in bolstering the stability of food security.

The quotes below reveal how government officials promote stability in food production thus improving food security. Farmers have received crucial training and financial assistance collaborating with NGOs, leading to notable increases in milk and beef production. Legislative actions and livestock expos have equipped farmers with valuable knowledge on livestock management, feed, and healthcare practices, and enhancing farm production. The successful establishment of connections between farmers and local networks highlights the achievements of small-scale rural farmers in achieving sustainable production.

*"We are working with NGOs, linking up our farmers with them so that they can access finance. We also provide fruitful training and monitor their farm and cattle health. Additionally, farmers can sustain their milk and beef production, thereby increasing farm productivity and household food security." VS-2 (DLS-2, Govt.)*

*"We follow legislative issues and development planning in agriculture and its sub-sectors to increase production segment-wise. Furthermore, we organize a livestock expo at the Upazila level. Additionally, farmers can access local networks for crossbreeds, animal health, quality feeds, fodders, and market links, which enhances*



*their mobility and farm output, including milk and beef. As a result, they can sustain production and improve household food security."* DLO-2 (DLS-2, Govt.)

As a result of the above initiatives, milk and beef production has increased. Table 5.16 reveals a comparison of milk and beef production between DLO-2 and DLO-3 for 2019-2020. DLO-2 achieved higher production levels for both milk (114.358) and beef (106.923) compared to DLO-3 (102.865 and 93.049, respectively). The percentage difference in production between the two regions was 11.49% for milk and 13.87% for beef, indicating a better performance of DLO-2 in milk and beef production during the specified period.

**Table 5. 16     Production comparison- DLO-2 Vs DLO-3 (2019-2020)**

Production	DLO-2	DLO-3	Production in %	Govt.
Milk production	114.358	102.865	11.49%	DLO-2
Beef production	106.923	93.049	13.87%	DLO-2

Further evidence of efforts to promote stability of food supply can be evidenced by efforts from the NGO and private organizations that participated in the study. They highlight the perspectives of two organizations, TMSS-2 (an NGO) and YC-1 (a private organization), regarding the significance of sustainable production and its impact on food security.

*"The Porabari area has been chosen for beef fattening, while the farmers from the Hatgari area have been selected for the dairy farm. These Hatgari and Porabari farmers have 5-6 cows on their respective farms. They serve as model farmers, demonstrating sustainable beef production compared to all loan borrowers. Maintaining a certain number of cows is essential to sustain farm production, increasing income and enhancing household food security. "* - TMSS-2 (NGOs)

*"In Bogra district, our farmers sustain production and income through income diversification, thanks to constant earnings from milk supply to Grameen-Danone Pvt. Ltd. The increase in household income contributes to enhanced farm production, improving household food security."* YC-1 (Pvt. Org.)

TMSS-2 discusses the selection of model farmers engaged in beef fattening and dairy farming in the Porabari and Hatgari areas. These farmers have implemented sustainable

practices, improving household food security through beef and dairy production. Similarly, YC-1 emphasizes how farmers in the Bogra district sustain production by diversifying their income, mainly through supplying milk to Grameen-Danone Pvt. Ltd. The stable income generated from these activities enhances farm production and eventually contributes to household food security.

However, TMSS-2 also highlights the challenge of sustaining production due to factors such as the number and health of livestock on the farm. On the other hand, YC-1's case demonstrates that farmers can diversify their income by engaging in various activities such as crop farming, fisheries, and petty trading. The formation of a cooperative that supplies milk to Grameen-Danone Pvt. Ltd. ensures a stable market price for their products, contributing to sustainable production and income. This confirms that it is essential to consider sustainable income, diversified livelihoods, and market linkages to achieve sustainable production and improve household welfare indicators.

For the majority of the farmer participants, stability relates to ensuring sustainable production on their farms by implementing strategic practices. Farmer SAK's preference for local indigenous breeds, despite implementing good marketing strategies, results in genetic challenges leading to unsustainable production. Farmer SHA faces low milk production caused by aging cows, which hinders his ability to sustain production. Both farmers' experiences underscore the importance of sustainable production practices in ensuring food security and stability for milk and beef farmers.

*"I have chosen not to engage in crossbreeding as the local community prefers milk from indigenous varieties. Despite implementing a good marketing strategy, I need help meeting the demand for milk due to genetic issues, as the indigenous breed produces a lower quantity of milk. As a result, my milk production is not sustainable, directly impacting food security in the area." SAK*

*"My milk production from the Holstein Friesian breeds is 4-5 liters per cow, twice daily. However, I suspect that the low milk output is due to the age of the cows, as they might be too old. This age-related factor contributes to the decrease in milk production. Unfortunately, I do not have stable production on the farm, which hinders my ability to achieve sustainable production." SHA*

SAK's case and SHA's situation both emphasize the criticality of stability in ensuring household food security. SAK's preference for indigenous breeds and the negative impact of non-sustainable practice align with the importance of sustainable production. Similarly, SHA's struggle with low milk output from aging cows directly affects his production and income, leading to an unstable situation. In summary, SAK and SHA's experiences provide evidence of the importance of stability in food production to enhance food security.

## **5.2 Sustainable farming practices for sustainable income**

Farmers adopt methods that involve careful resource utilization and follow systematic processes in sustainable food production practices. They also prioritize maintaining positive relationships with people, ensuring animal welfare, integrating traditional knowledge into their farming practices, and focusing on long-term environmental and economic goals. These practices aim to create a safe and sustainable food system for individuals, communities, and consumers, ensuring a viable future for generations to come.

Key indicators, such as the food, crop, and livestock production indexes, help assess production status, guiding evidence-based decisions for sustainable production. Livestock Management lies at the core of their approach, fostering resilience through income diversification and responsible practices, leading to a more robust food system that benefits individuals, communities, and consumers alike.

### *5.2.1 Livestock management*

The findings highlight the role of livestock management at the core of farmers' approach, as they prioritize sustainable food production practices that foster resilience amid changing agricultural landscapes. Farmers ensure economic stability and environmental stewardship by integrating responsible practices into livestock care and agricultural processes. This sustainable production practice contributes to a more robust and secure food system, benefiting communities and consumers.

The 2019 Livestock Production Index for Bangladesh (Table 5.17) show that the country achieved a Livestock Production Index of 105.2 out of 213.4, ranking 84th globally among 188 countries. However, this index falls short by 2.3 points compared to the global average of 107.5, indicating a deficit in livestock production. The 84th global rank underscores

sustainability challenges in livestock production, emphasizing the need for adopting sustainable practices to address existing unsustainable approaches in livestock management.

**Table 5. 17 Livestock Production Index 2019**

Livestock Production Index 2019 (A)	Index points (B)	Global ranks (C)	Available data (D)
Bangladesh	105.2 out of 213.4	84 out of 188	1961-2019
The world average index points based on 188 countries in 2019	107.5		

Source: LPI, 2019<sup>19</sup>

Integrating responsible livestock management methods and sustainable food production practices can contribute to improved food security in the country. Policymakers can utilize these insights to support evidence-based decisions and promote sustainable farming practices, fostering a secure and sustainable future for Bangladesh.

*"We work on two issues to increase milk or beef production. One is milk/beef production, and the other is medical and disease management concerning artificial insemination, which affects farm production."* DLO-1, Govt.

*"We started our quality control lab in January of this financial year, 2021. The lab has already taken samples (meat sample) to experiment."* VS-1, Govt.

*"I specialize in addressing various livestock-related concerns for my loan borrowers. My expertise spans a range of important areas, including environmental issues, farm management, health, hygiene, and safety matters of small-scale dairy or cattle farms."* - GB-1.

An example of sustainable production practice is crossbreeding cows in livestock farming. Crossbreeding is crucial particularly for small-scale farmers, as it enhances livestock productivity and yields higher income. As evidenced by successful crossbreeding practices, sustainable production contributes to overall household welfare, encompassing various

<sup>19</sup> Note. "From Livestock Production," by LPI, 2019, *Livestock Production Index*. ([https://www.theglobaleconomy.com/rankings/livestock\\_production\\_index/](https://www.theglobaleconomy.com/rankings/livestock_production_index/))

aspects such as income, consumption, expenses, and assets. This indicates that sustainable production is linked to household welfare and can lead to increased income and improved food security.

The insights from GB-1's interview affirm that crossbreeding is a viable strategy to achieve sustainable production and highlight its positive effects on household income and overall well-being. According to this NGO participant, loan borrowers that practiced artificial insemination and effectively managed crossbreeding obtained a higher daily milk yield of 7-8 liters per cow than the indigenous variety yielding only 3-4 liters. This demonstrates the significant impact of crossbreeding on improving production.

*"My loan borrowers obtained 7-8 liters of milk per cow daily. They practiced artificial insemination and effectively managed crossbreeding. In contrast, I observed an indigenous variety that yields only 3-4 liters of milk per cow daily. As a result, I advised my loan borrowers to opt for crossbreeding cows to achieve sustainable production, which, in turn, leads to increased household income and improved food security."* GB-1 (NGO)

Farmers' overall experience appears to support this practice as the ability or otherwise to practice crossbreeding could really impact sustainable production. The quotes below are representative of the majority of the participating farmers.

*"I need to crossbreed four cows. Among these four cows, the Sahiwal breed yields little milk. This cow produces up to 7-8 liters of milk daily. The other cows are currently pregnant, and milking will be delayed further. In our area, these cows can produce a maximum of 13 liters of milk, insufficient to cover the feeding and health care expenses. As a result, I do not foresee sustainable milk production, as my expenses are exceedingly high."* ZIA

*"I encountered issues with skin, foot, and mouth diseases on my farm, which significantly affected milk production. I tried purchasing a vaccine from a private seller to address the problem, but unfortunately, it proved ineffective for my cattle. Moreover, the government office has limited vaccine availability, making obtaining sufficient quantities for my herd challenging. As a result, I cannot achieve sustainable production on my farm."* SHR

Farmer ZIA experienced difficulties with low milk production rates and high costs, despite crossbreeding cows. This is due to inadequate feed and healthcare for their dairy cows, leading to high operational costs and unstable income. Farmer SHR faced challenges related to diseases impacting milk production, and their attempts to purchase effective vaccines were unsuccessful. They emphasized the criticality of generating income to sustain their production. However, due to the high cost of animal feed and inadequate animal healthcare, they could not enhance their farm's production.

### 5.2.2 *Income diversification*

Another food production practice that plays an important role is income diversification for farmers. By engaging in multiple income-generating activities, such as crop cultivation, livestock rearing, agribusiness ventures, non-farm activities, or off-farm employment, farmers can reduce their reliance on a single income source. This diversification makes them more resilient to economic fluctuations and potential risks arising from changes in market conditions or external factors. In regions where agricultural income may be vulnerable to weather variability, market fluctuations, or pest and disease outbreaks, diversifying income sources can provide farmers with a more stable and sustainable livelihood. Income diversification is a valuable strategy to improve household income, increase resilience, and enhance food security for farming communities, ensuring a better quality of life and a more secure future for the farmers and their families.

*"My source of income comes from only milk and beef production to support my family. Still, I am facing challenges due to disease, business syndicate, unstable market, and uneven weather patterns. I, therefore, need multiple sources of income that may come from fisheries, home gardening, horticulture, and small enterprise to cover my food security needs." - FIR*

*"I have a small-scale dairy farming and beef fattening project. I am struggling to survive due to climate change, unstable politics, policies, and a lack of market monitoring by government agencies. I am trading as a veterinary supplier through a small business in the afternoon. My additional income comes from this business, cropland, and fisheries project to support my family and farm." - ANI*

*"I am devising a strategy to establish multiple sources of income for operating my small-scale dairy and beef farming venture. By integrating financial support, biogas utilization, and organic crop production, I anticipate a significant positive impact on my family's livelihood. The resulting financial development will also garner attention from the broader community." - ASA*

Farmers in Bangladesh play a pivotal role in implementing sustainable farming practices to contribute to income diversification. As the relationship between income diversification, food security, and multidimensional poverty are intertwined, various aspects of food security are essential in addressing poverty and hunger. Income diversification can provide other sources of revenue and income for farm-based entrepreneurs that could substantially elevate household income levels. The 2016 Household Income and Expenditure Survey provide valuable insights into Bangladesh's poverty indicators (see Table 5.18). Bangladesh has made notable progress in poverty reduction, with a decreasing poverty rate, reflecting positive strides towards achieving the Sustainable Development Goals (SDGs).

**Table 5.18 Poverty Indicator**

Poverty	Number of poor (million)	Rate (%)	Period
The national poverty line	39.6	24.3%	2016
International poverty line (less than \$1.90 per day per capita)	22.6	14.3%	2016
Lower middle income class poverty line (less than 3.20 per day per capita)	82.6	52.3%	2016
Upper middle income class poverty line (less than \$5.50 per day per capita)	133.0	84.2	2016
The extreme poverty line of Bangladesh		12.9%	2016
International Extreme poverty line		14.8%	2016
Multidimensional Poverty Measure		21.2	2016

Source: HIES, 2016<sup>20</sup>

The Sustainable Development Goals (SDGs) 1 and 2, focus on eradicating poverty and achieving zero hunger and are inextricably linked to the ability of farmers to produce food within the agricultural ecosystem. Farmers in rural areas serve as market facilitators, buying and selling farm materials, livestock, and crops. Farm-based social entrepreneurs promote

<sup>20</sup> Note. "From Household Income and Expenditure," by HIES, 2016, *Household Income and Expenditure Survey*. (<http://data.gov.bd/dataset/household-income-and-expenditure-survey-hies-2016>)

food production which can only be sustained if they escape the subsistence nature of their farm operations. Diversification can increase their income potential and reduce poverty.

The ADB data for Bangladesh (Table 5.19) sheds light on poverty and unemployment indicators in Bangladesh, aligned with SDG goal 1 of eradicating poverty. Key details include the notable 16.5% disparity in purchasing power parity between the employed and unemployed populations, with a 5.2% unemployment rate in 2021, influenced by the COVID-19 pandemic's impact. The analysis emphasizes the interconnectedness between poverty and food security, impacting various aspects of well-being. It also underscores the significant role of farm-based social entrepreneurs in advancing sustainable practices and contributing to poverty elimination and societal well-being. Prioritizing income diversification and sustainable practices can help achieve SDG goal 1, fostering a more prosperous and secure future for Bangladesh.

**Table 5. 19    ADB’s data** (SDG’s goal of Bangladesh, SDG’s goal 1)

Poverty	Rate (%)	Period
A portion of the population lives below the national poverty line.	20.5%	2019
A portion of employed population lives below \$1.90 purchasing power parity daily (age 15 or older) female.	6.2%	2019
A portion of employed population lives below \$1.90 purchasing power parity daily (age 15 or older) male.	5.3%	2019
A portion of the employed population lives below \$1.90 purchasing power parity daily (e.g., age 15 or older).	4.0%	2021
The unemployment rate is calculated by male or female.	5.2%	2021
A mortality rate is 29 per 1000 live births under 5.	2.9%	2020

*Source: ADB, 2022<sup>21</sup>*

From the farmers’ perspective, the quotes below showcase three farmers' experiences with small-scale farming and income diversification. Farmer KHA faces challenges with milk production and high feed costs, worsened by COVID-19 restrictions. Farmer SAI utilizes profits from various sources but still encounters food security issues due to fluctuating milk production and crop prices. Farmer JEW attempted income diversification but ended up in multidimensional poverty.

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<sup>21</sup> Note. "From Bangladesh: Poverty," by ADB, 2022, *Asian Development Bank*.  
<https://www.adb.org/countries/bangladesh/poverty>



*"I am not earning enough income due to insufficient milk production. The dry feed and concentrate in the market are too expensive for me. As a result, I cannot adequately feed my cows to obtain enough milk. The COVID-19 restrictions have further exacerbated my problems, leading to decreased production and income. I face significant challenges to survive and feel I am not playing a sustainable role in this situation." KHA*

*"I engage in small-scale farming and also take care of my household. Therefore, I use the profits from my farming activities when needed. I have ongoing household production from cropland, home gardening, and fisheries. However, despite these efforts, I face a food security problem due to fluctuations in milk production, sudden drops in crop prices, and the impact of seasonal diseases on my cattle. As a result, my production and income decline, directly affecting my food security and overall sustainable livelihood." SAI*

*"In our village, each household has 2-1 cows or bulls. Inspired by this, I decided to cultivate crops and run dairy farms and fisheries, exploring a different avenue for income diversification. However, despite my efforts, I faced challenges increasing my income and ensuring household food security. Unfortunately, this situation eventually led me into multidimensional poverty." JEW*

These findings underscore the notion that although income diversification is a good strategy, it needs careful consideration and implementation. Diversification can also be adversely impacted by external shocks like the effect of COVID-19 on the prices of feed and other materials, market fluctuations and seasonal diseases.

Another sustainable production practice relates to the farmer's ability to take control of their milk from production to market. This can be done successfully with the support of private lenders to finance their operations as well as establish cooperatives. The quote from a representative of Grameen Bank underscores the organization's mission-driven objective to enhance household production, income, and food security.

*"We had a mission-driven objective to increase household production, income, and food security. Therefore, we selected dairy farmers to create the raw material source*

*for Grameen-Danone Yogurt. We established a dairy cooperative and provided them with a specific loan to purchase dairy cows. As a result, they achieved sustainable milk production and now supply milk to Grameen-Danone Pvt. Ltd."* YC-1 (Pvt. Org.)

YC-1 has created a raw material source for Grameen-Danone Yogurt by selecting dairy farmers and establishing a dairy cooperative. The organization provided specific loans to farmers to purchase dairy cows. The produced milk is then supplied to Grameen-Danone Pvt. Ltd. This approach focuses on increasing household food production and income. This is achieved through a vertical market link between the dairy cooperative and Grameen-Danone Pvt. Ltd., ensuring fair market prices for small-scale dairy farmers. It highlights the significance of start-up loans, functioning dairy cooperatives, and market links. These factors contribute to increased income and improved food security for households. The evidence from the interview supports the notion that dairy cooperatives play a crucial role in fostering stable milk production, thereby positively impacting household income. Consequently, YC-1's efforts exemplify the potential for private organizations to contribute to sustainable production, income generation, and food security in dairy farming.

NGOs and private organizations support to small farmers in different regions of Bangladesh highlight the significance of access to working capital in sustaining small-scale farming in rural areas. Access to working capital is a crucial challenge affecting sustainable production and household food security. However, the data underscores the importance of considering factors beyond sustainable production alone to enhance household food security effectively. Access to working capital emerges as a critical component in achieving sustainable production through income diversification and improving chances of food security for small farmers. Therefore, addressing working capital challenges is vital in promoting farming practices and enhancing overall welfare in rural Bangladesh.

These findings reveal various challenges these farmers face, including the pandemic's repercussions, market fluctuations, low production, cattle diseases, credit constraints, and adverse weather conditions. These factors collectively contribute to multidimensional poverty, adversely affecting sustainable production, income generation, and livelihoods. The findings confirm the important role of agripreneurship in promoting sustainable food production and the importance of income diversification in overcoming challenges faced by farm-based social entrepreneurs.

### 5.2.3 Sustainable production

The government (as represented by the government officials interviewed for this study) showed dedication in promoting sustainable production practices in Bangladesh. Initiatives like free seeds, fertilizers, livestock, vaccines, and essential resources support farmers and women entrepreneurs in increasing production and achieving household food security. These efforts emphasize the connection between sustainable production and improved food security. Furthermore, the government's emphasis on animal healthcare services and crossbreeding support contributes to increased livestock production. These comprehensive initiatives are vital in addressing food security challenges and promoting socio-economic well-being. The quotes from government officials reveal insights into sustainable livestock farming practices in different regions of the country.

*"We provide free seeds, fertilizers, and livestock as capital so farmers/women entrepreneurs can start small-scale farming at home to increase their production and support their households."* VS-3 (DLS-3, Govt.)

*"We provide free vaccines, medication, and crossbreeding materials, as well as essential items like gloves and strips, to support our farmers in mobilizing their farm operations, increasing production, and ensuring household food security."* DLO-3 (DLS-3, Govt.)

Further evidence is shown in Table 5.20 represented by a scale that shows 1–2 cattle (marginalized), 3–4 cattle (subsistence), and 5 cattle or above (small farmer/commercial farmer). This illustration stresses the importance of sustainable livestock farming practices and the role of veterinary services in enhancing farm productivity and income, especially for small-scale farmers. These insights can guide policymakers and stakeholders in formulating effective interventions to promote sustainable production and address challenges in the livestock sector.

**Table 5. 20 Sustainable production** (from Government Official participants)

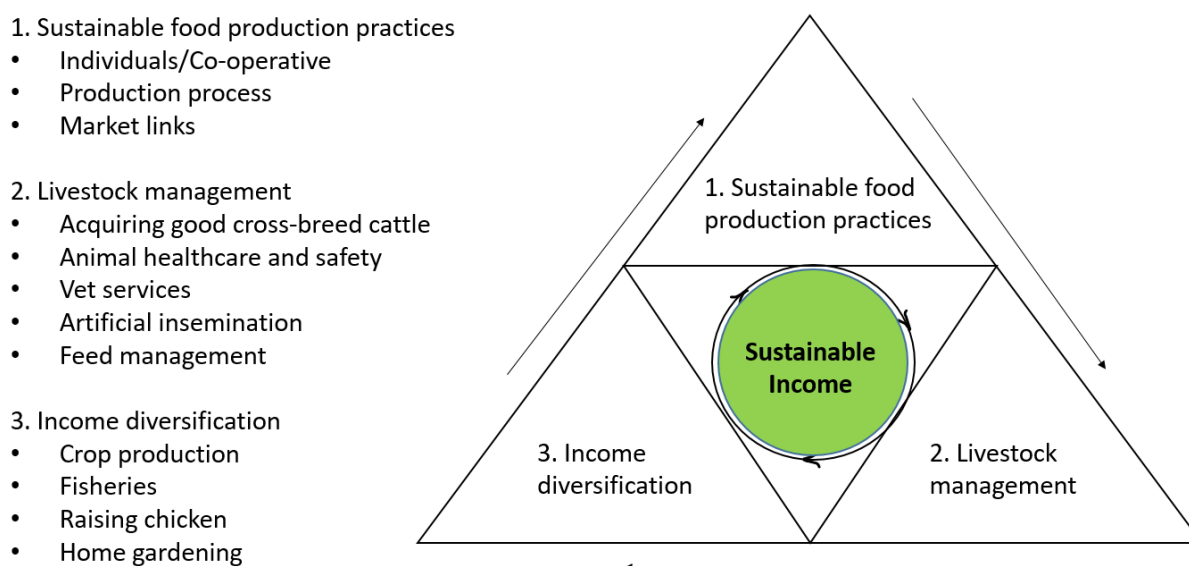
	Area	Sustainable production	
Interviewee number	North/ South	Scale 1 to 5 or above	Identify sustainable food production practices for achieving sustainable income.

VS-1, Gob Veterinary Service Officer, DLO-1	North	Scale: 1-2 cattle (marginalized) a) Enough production: No b) Good health: No c) Access to food nutrition: No d) Livestock insurance: No e) Home/Shelter: Yes	a) Provides Artificial Insemination (AI) service b) Grass Seeds c) Vaccines
DLO-2, DLS Office, DLO-2	South	Scale: 3-4 cattle (subsistence) a) Enough production: Yes b) Good health: Yes c) Access to food nutrition: Limited d) Livestock insurance: No e) Home/Shelter: Yes	a) Provides vet services and medications b) Vaccines c) Artificial Insemination (AI) link with private organizations and NGOs
DLO-3, Department of Livestock Service Office, Borhanuddin, Bhola		Scale: 5 or above cattle (small farmer) a) Enough production: Yes b) Good health: Yes c) Access to food nutrition: Limited d) Livestock insurance: No e) Home/Shelter: Yes	a) Provides vet services and medications b) Vaccines c) Health and farm safety service d) Biosecurity service and disease protection awareness

The officials interviewed for this study identified key factors contributing to sustainable production and income generation. Based on their reports, there are variations in the sustainability of farming practices across different scales of production, from marginalized to small-scale farmers. The reports emphasize the critical role of animal healthcare, particularly vaccination and veterinary services, in enhancing farm production and ensuring good health for cattle. Vaccination is an essential practice that positively impacts farm production and income. Additionally, providing veterinary services and medications is essential for reducing expenses and improving farm productivity.

#### 5.2.4 Outcomes from the analysis

The findings of this study underscore three crucial elements for small-scale milk and beef farmers to achieve sustainable income: sustainable food production practices, livestock management, and income diversification. The visual representation in Figure 5.2 emphasizes the synergies between these elements, underscoring their collective role in building a robust and secure food system for farmers and their communities.



**Figure 5.2 Sustainable food production practices, and income diversifications**

### *Sustainable food production practices*

Sustainable food production practices are central to enhancing economic stability for farmers. This involves a dual focus on both individual farmers and cooperative efforts. Farmers are encouraged to adopt responsible production processes that prioritize environmental sustainability and resource efficiency at the individual level. Simultaneously, cooperative endeavors enable a collective approach to sustainable practices, fostering community resilience. The integration of sustainable production processes is further strengthened by establishing market links, ensuring efficient connections between produced goods and markets, thereby enhancing the economic viability of the entire process.

### *Livestock management*

Livestock management is another critical aspect influencing the sustainable income of small-scale farmers. The strategic acquisition of crossbreed cattle is essential, emphasizing the significance of selective breeding for improved productivity. Ensuring the health and safety of animals through proper healthcare and safety measures is integral to sustained productivity. Veterinary services, artificial insemination techniques, and effective feed management are interconnected components that collectively contribute to optimal livestock management. These practices not only enhance the quality of livestock but also directly impact the economic outcomes for farmers.

### *Income diversification*

Income diversification is a crucial strategy for small-scale farmers to achieve sustainable income. Diversification includes engaging in various income-generating activities beyond traditional farming. Crop production, fisheries, poultry farming, and home gardening are identified as viable channels for income diversification. Farmers can produce a surplus of goods from the field and other activities, which can be consumed, sold in the market, or reinvested in the agricultural and livestock sectors. This approach mitigates the risk associated with relying solely on one source of income, contributing to increased economic resilience for small-scale farmers.

In summary, the three highlighted elements—sustainable food production practices, livestock management, and income diversification—are interconnected strategies that, when implemented cohesively, enhance the economic stability and overall livelihoods of small-scale milk and beef farmers. These practices contribute to sustainable income and foster environmental stewardship and community resilience in the face of economic and environmental challenges.

## **5.3 The role of farmers in the agripreneurial ecosystem**

The agripreneurial ecosystem heavily relies on farmers, making them the cornerstone of the rural economy. The data analysis conducted at the research site demonstrates farmers' diverse and critical role in producing staple foods, fibres, livestock, milk, fisheries, poultry, and other agricultural products. Moreover, farmers' cultivation of high-value crops and income diversification create employment opportunities both on-farm and off-farm, effectively reducing unemployment and improving food security. Farmers' efforts significantly combat malnutrition and address inadequate local, regional, and national resources. Additionally, farmers play a pivotal role in poverty reduction and market facilitation, making their contributions indispensable for Bangladesh's economic development. Their efforts ensure a stable food supply, generate income, and alleviate poverty in rural areas. Overall, farmers emerge as key drivers within the agripreneurial ecosystem, playing a crucial role in fostering food security, economic growth, and improved livelihoods in the agricultural sector.

### *5.3.1 Food producer*

The findings in Table 5.21 highlight the importance of farmers as the main drivers of food production. The Livestock Production Index data underscores the vital role of farmers in

livestock production, as they are fundamental contributors to the agricultural ecosystem and play a critical role in promoting food security.

**Table 5. 21 Livestock Production Index, 2019**

Livestock Production Index 2019 (A)	Index points (B)	Global ranks (C)	Available data (D)
Bangladesh	105.2 out of 213.4	84 out of 188	1961-1919
The world average index points based on 188 countries in 2019	107.5		

Source: LPI, 2019<sup>22</sup>

The data highlights that farmers are market facilitators, risk-takers, and significant food producers. They are at the forefront of livestock production, and their efforts directly impact the Livestock Production Index of the country. As such, farmers' involvement and performance in livestock production directly influence Bangladesh's overall livestock production scenario.

*"I work as a food producer, dedicating my time to cultivating crops and rearing livestock. Through my efforts, I contribute to the country's food production and supply, playing an essential role in sustaining individuals, local communities and supporting the nation's agricultural sector." SYD*

*"As a food producer, I actively engage as a market facilitator and risk-taker, managing crop cultivation and livestock rearing to supply essential food resources to the community. My involvement significantly enhances overall productivity and supports people's well-being." MIS*

Furthermore, the findings indicate that farmers' constraints, such as unsustainable markets and political instability, can hinder their ability to contribute effectively to livestock production. By addressing these challenges and supporting farmers in adopting more compatible and innovative technologies, they can improve their livestock production practices and enhance food production.

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<sup>22</sup> Note. "From Livestock Production," by LPI, 2019, *Livestock Production Index*. ([https://www.theglobaleconomy.com/rankings/livestock\\_production\\_index/](https://www.theglobaleconomy.com/rankings/livestock_production_index/))

In essence, the Livestock Production Index data underscores the central role of farmers as food producers and the main drivers of sustainable food production practices. Improving farmers' livelihoods and empowering them with the necessary resources and support are crucial steps towards achieving sustainable livestock production and ensuring a more robust food system in Bangladesh.

The link between the role of farmers as food producers and the multidimensional poverty in rural Bangladesh (Table 5.22) demonstrate that a significant proportion of the population is vulnerable to multidimensional poverty, facing deprivations in health, education, and standard of living. Farmers, as key players in the agripreneurial ecosystem, are crucial in addressing these challenges. The headcount poverty rate of 24.6% indicates that many farmers are living in poverty, struggling to meet basic needs, and facing various deprivations. The intensity of deprivations at 42.2% further emphasizes the severity of challenges faced by farmers in rural areas.

**Table 5. 22    Multidimensional poverty index (MPI) for Bangladesh**

Survey Year		2019
MPI Value		0.104
Head- count (%)		24.6
Intensity of Deprivations (%)		42.2
Vulnerable to multidimensional poverty	Population share (%)	18.2
In severe multidimensional poverty		6.5
Below monetary poverty line		14.3
Health	Contribution to overall poverty of deprivations in (%)	17.3
Education		37.3
Standard of living		45.1

Source: *GMPI, 2021*<sup>23</sup>

The findings suggest that enhancing sustainable food production practices and improving farmers' income is essential to alleviate multidimensional poverty. By empowering farmers to adopt sustainable food production practices, such as livestock production and diversified income sources, it becomes possible to improve their household welfare and reduce their vulnerability to poverty.

<sup>23</sup> Note. "From Global Multidimensional Poverty, "by GMPI, 2021, *Global Multidimensional Poverty Index*. (<https://hdr.undp.org/content/2021-global-multidimensional-poverty-index-mpi#/indicies/MPI>)



Additionally, the study shows that a significant percentage of the population falls below the monetary poverty line, indicating that income generation and economic stability are crucial in addressing poverty issues. As farmers play a central role in food production and income generation, their economic well-being directly impacts their ability to escape poverty and improve their livelihoods.

In conclusion, the findings from Table 5.22 underscore the pivotal role of farmers as food producers and their connection to multidimensional poverty in rural Bangladesh. Sustainable food production practices and income diversification are essential strategies to improve the welfare of farmers and their communities, contributing to poverty reduction and enhancing overall well-being.

### 5.3.2 *Employment provider*

The study highlights the significant role that farmers play as employment providers in the agricultural sector of Bangladesh. Agriculture is a labor-intensive industry; farmers require a substantial workforce for various farming activities, which creates numerous on-farm employment opportunities in rural areas. Farmers engaged in agribusiness ventures and small-scale processing units generate further job opportunities. The agricultural supply chain and distribution sectors also benefit from farmers' input demand, leading to employment generation in related industries. This underscores the crucial contribution of farmers in driving employment and sustaining rural livelihoods in Bangladesh, thereby enhancing overall socio-economic development in the country.

*“... Additionally, the growth in the dairy sector can generate employment opportunities, address unemployment issues, and create new jobs.”* TMSS-2

*"At the Upazila Livestock Office (DLO), we collaborate with farmers by providing essential veterinary services and training opportunities. Through government-funded programs, we invite farmers to our office, providing training and an allowance of Taka 200 per head and lunch. This collaboration enhances farm production, fosters food security, and promotes food production practices in the agricultural sector."* DLO-1 (Gob, Govt.)

Table 5.23 provides valuable insights into the role of social entrepreneurs and the challenges faced by small-scale farmers in the agripreneurial ecosystem. As farmers seek support from various social entrepreneurs, such as vet doctors, trainers, advisors, and facilitators, they create employment opportunities for these service providers. This collaborative effort between farmers and social entrepreneurs contributes to economic growth in rural areas and helps reduce unemployment.

**Table 5. 23 A cross-case analysis**

	Area	Size of small-scale farms	
Interviewee Number	North/ South	Scale 1 to 5 or above	Assessing the current role of social entrepreneurs in the agripreneurial ecosystem
VS-1, Gob Veterinary Service Officer, DLO-1	North	Scale: 1-2 cattle (marginalized) a) Enough production: No b) Good health: No c) Access to food nutrition: No d) Livestock insurance: No e) Home/Shelter: Yes	a) Vet doctor b) Trainer c) Advisor d) Facilitator
DLO-1, Department of Livestock Service Office, Gobindaganj, Gaibandha	North	Scale: 1-2 cattle (marginalized) a) Enough food: No b) Good health: No c) Access to food nutrition: No d) Livestock insurance: No e) Home/Shelter: Yes	a) Livestock service provider b) Trainer c) Advisor d) Facilitator e) Preparing and implementation of the development project
DLO-3, Department of Livestock Service Office, Borhanuddin, Bhola	South	Scale: 5 or above cattle (small farmer) a) Enough food: Yes b) Good health: Yes c) Access to food nutrition: Limited d) Livestock insurance: No e) Home/Shelter: Yes	a) Facilitator b) Trainer c) Advisor d) e-livestock, one-stop service, mobile and digital service provider

Furthermore, the collaborative approach between farmers and government agencies is evident in the cross-case analysis. Farmers actively engage with government entities, such as the Department of Livestock Services (DLS) and Upazila Livestock Office (DLO), to access essential veterinary services, training, and advisory support. This collaboration enables farmers to improve their farm production and enhance household food security and welfare. It demonstrates how farmers and government agencies work together to address challenges and promote sustainable production practices.

*"As a model farmer, I actively work with Livestock Services (DLS) and Upazila Livestock Office (DLO) to access veterinary services, training, and advisory support.*

*This close connection and network significantly enhance my farm production and household food security and promote sustainable practices."* DAS (Shib-1)

*"As a veterinary surgeon and representative of the Department of Livestock Services (DLS), my primary role involves providing farmers essential veterinary services, training, and advisory support. Through phone consultations, local field visits, and practical guidance, we actively collaborate to enhance farm production, ensure the household food security of our farmers, and promote their sustainable practices. My dedicated focus on medical care ensures the effectiveness of our farmer-government agency cooperation."* VS-1 (Gob, Govt.).

*"At the Upazila Livestock Office (DLO), we have taken a proactive approach to address the field of artificial reproduction. While private institutions like BRAC, ACIs, and Lal Teer are also involved with us, we have trained AI (Artificial insemination) technicians who are skilled and reputable. These trained technicians are effectively working at the ground level, contributing to the DLO's efforts to promote and implement artificial reproduction techniques in the region."* DLO-3 (Bor, Govt.)

Table 5.23 highlights how farmers' roles as employment providers and their collaboration with social entrepreneurs and government agencies are interconnected. By working together, farmers and social entrepreneurs contribute to economic development in rural areas while ensuring sustainable production practices. Additionally, the involvement of government agencies strengthens the support system for farmers, addressing their challenges and promoting agricultural resilience. Ultimately, this collaborative approach fosters poverty reduction, enhances livelihoods, and contributes to a more sustainable and secure agricultural sector.

### 5.3.3 Market facilitator

As a matter of course and by virtue of their occupation, farmers work as market facilitators through their collaboration with NGOs and private organizations in the ecosystem. The roles of social entrepreneurs, including loan providers, financial advisors, facilitators, market coordinators, and change-makers, demonstrate the active involvement of farmers in

facilitating market access and promoting sustainable farming practices. Farmers, in particular, play a crucial role as market facilitators by bridging the gap between producers and markets. As market facilitators, farmers connect agricultural produce to consumers and markets. They act as intermediaries, ensuring their products reach buyers at the right time and price. Farmers also contribute to value addition, packaging, and quality control, which are essential aspects of marketing agricultural products effectively.

The findings (see Table 5.24) show that farmers in the North-West and North regions are actively engaged as market facilitators, providing valuable support to fellow farmers by sharing market information, coordinating with buyers, and participating in marketing initiatives.

**Table 5. 24 A cross-case analysis (NGOs Vs. private)**

	Area	Size of small-scale farms	
Interviewee Number	North/South	Scale 1 to 5 or above	Assessing the current role of social entrepreneurs in the agripreneurial ecosystem
TMSS-1, Rajosh Branch, Gobindaganj, Gaibandha	North-West	Scale: 1-2 cattle (marginalized) a) Enough food: No b) Good health: No c) Access to food nutrition: No d) Livestock insurance: No e) Home/Shelter: Yes	a) Loan provider b) Financial advisor c) Facilitator d) Preparing development project e) Incubation program service
GB-1, Rajosh Branch, Gobindaganj, Gaibandha	North-West	Scale: 5 or above cattle (small farmer) a) Enough food: Yes b) Good health: Yes c) Access to food nutrition: Limited d) Livestock insurance: Yes e) Home/Shelter: Yes	a) Loan provider b) Financial advisor c) Facilitator d) Preparing development project e) Incubation program service f) Change maker
YC ( <i>Grameen Danone Foods Ltd.</i> ) Bogra Branch, Bogra	North	Scale: 5 or above cattle (small farmer) a) Enough food: Yes b) Good health: Yes c) Access to food nutrition: Limited d) Livestock insurance: Yes e) Home/Shelter: Yes	a) Loan provider b) Financial advisor c) Facilitator d) Market Coordinator e) Incubation program service f) Change maker

Their role in market facilitation contributes to improved market access for small-scale farmers, enabling them to sell their products and generate income. Furthermore, NGOs and private organizations as social entrepreneurs in the agricultural sector amplifies the impact of

farmers' market facilitation efforts. These organizations provide farmers additional resources, training, and support, enabling them to access broader markets and secure better prices for their produce.

*"As a market facilitator, my role involves connecting farmers with potential buyers and ensuring a smooth milk production flow to BRAC's milk collection points, which serve as another NGO. However, there is a desire to establish a dairy cooperative to enable direct sales of their milk. The vision is to create a platform where farmers can benefit from cooperative activities and gain advantages for themselves as facilitators. We are working on establishing the dairy cooperative to support the farmers in making this initiative a reality."* TMSS-1

*"I serve as the market facilitator for my branch in six unions across two districts (Gaibandha and Joypurhat). With 1,500 milk farmers in these unions, our structured group meetings, social media, and institutional networking enable seamless trade among our loan borrowers, creating a thriving market ecosystem within the community."* GB-1

*"As market coordinators, we bring together 500 dairy farmers, conduct regular visits, and leverage online networking to support our small-scale dairy project's marketing system. We focus on securing fair prices for our loan borrowers and maintaining a steady milk supply for the Grameen-Danone Yogurt."* YC

In summary, the findings demonstrate that farmers, NGOs, and private organizations all play a vital role as market facilitators within the agripreneurial ecosystem. Their active involvement in connecting producers with markets and consumers contributes to enhanced market access, increased income for farmers, and improved food security outcomes. Collaborative efforts between farmers, NGOs, and private organizations further strengthen their role as market facilitators, leading to more sustainable and resilient food production systems in Bangladesh.

#### 5.3.4 Agripreneurial ecosystem

The findings indicate that Bangladesh's entrepreneurial ecosystem related to food security creates a supportive environment for food-related entrepreneurship. As established in the

previous section, farmers play a critical role as market facilitators, connecting agricultural produce to consumers and markets making them key stakeholders in this ecosystem. Their active involvement in promoting desirable farming practices and coordination contributes to improved market access, increased income, and enhanced food security outcomes for small-scale farmers. The collaborative efforts between farmers, NGOs, private organizations, and government agencies further reinforce the role of farmers as key contributors to enhancing food security in the country. These findings strengthen the link between food-related entrepreneurship and sustainable food production practices.

Table 5.25 indicates that the agripreneurial ecosystem significantly influences the production levels and outcomes of different organizations, such as YC-1 and TMSS-1. The comparison between the two organizations' milk and beef production percentages highlights the importance of good farming practices in achieving higher yields and improving farm revenue. TMSS-1's higher percentage of milk production suggests that the organization's approach to sustainable production in the northern region of Bangladesh has been more successful than farmers in the south. As the analysis shows that TMSS-1 outperformed YC-1 in milk and beef production, it further supports the notion that farmers' active involvement and adoption of sustainable production practices can positively impact their income and overall well-being.

**Table 5. 25      Production comparison- YC-1 Vs TMSS-1 (Private Vs NGO)**

	YC-1	TMSS-1	Production in (%)	
Milk production	102.52	103.683	1.16%	TMSS-1
Beef production	97.526	97.998	0.47%	TMSS-1

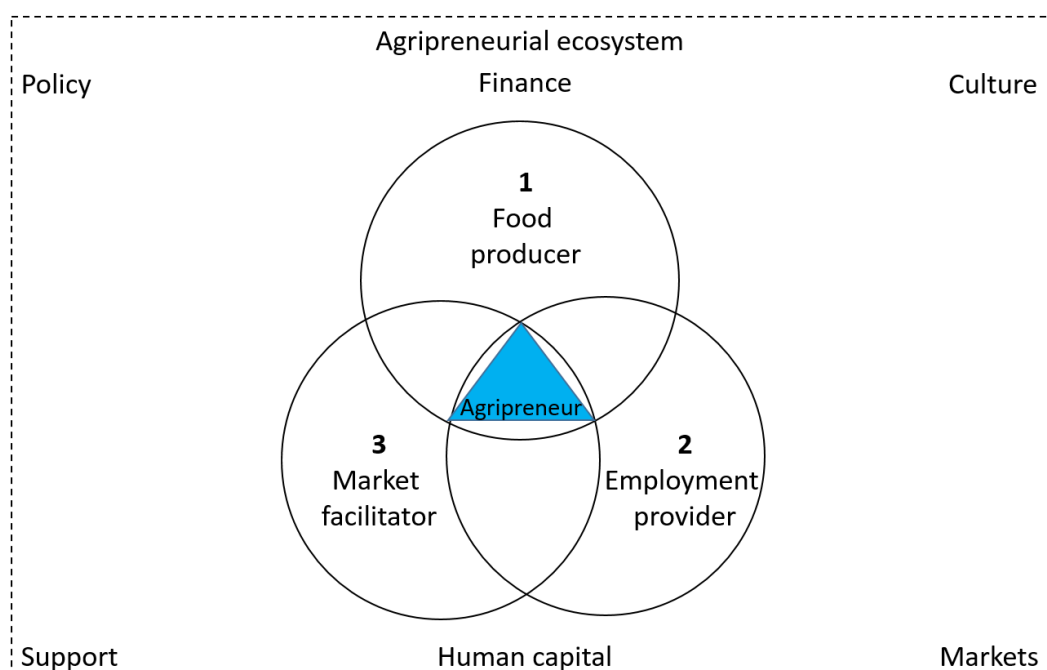
The findings further highlight the vital role of the agripreneurial ecosystem in fostering innovation, sustainable practices, and collaboration among various stakeholders, including farmers, NGOs, and private organizations. These collaborations can improve production outcomes in the region. In addition, the findings emphasize the need for continuous efforts and support from the agripreneurial ecosystem to promote sustainable production practices and ensure better livelihoods for farmers in Bangladesh.

### 5.3.5 Outcomes from the analysis

The analysis has revealed key outcomes highlighting the critical role of small-scale farmers, particularly those engaged in milk and beef production, in effectively managing farms

through cultural practices. Farmers play a significant part in income diversification by participating in various activities such as cropland cultivation, small-scale farming, fisheries, and horticulture. As a result, they contribute to enhanced household food security and the promotion of sustainable livelihoods in rural areas.

However, the findings also underscore the importance of fostering greater collaboration and interaction between farmers, NGOs, private organizations, and government officials to facilitate effective market facilitation. Many farmers need help in fulfilling their roles as market facilitators due to cultural farming practices that may lead to production shortfalls. This highlights the need for more sustainable agricultural production methods to ensure long-term success. Figure 5.3 visually represents the interconnected relationship between farmers and their multifaceted roles as food producers, employment providers, and market facilitators.



**Figure 5.3 Role of farmers within the agripreneurial ecosystem**

These roles are integral to the agripreneurial ecosystem, and it is important that they receive support from government agencies, NGOs, private organizations, and cooperatives. All these elements need to work together to promote sustainable practices in food production, income diversification, sustainable income generation, sustainable production methods, and poverty

eradication. These collective efforts contribute to establishing a sustainable livelihood for rural farmers.

Figure 5.3 further illustrates how farmers integrate various processes into their roles, including income diversification, food security measures, and poverty elimination. Farmers are willing to take calculated risks by cultivating crops, managing small-scale farms, operating fisheries, and horticulture, and showcasing innovative ideas for marketing, farm operations, technological advancements in planting and harvesting, climate resilience adaptation, and disease control. These agricultural innovations represent significant contributions made by farmers. In conclusion, the outcomes emphasize the pivotal role of small-scale farmers within the agripreneurial ecosystem to promote food security.

#### **5.4 Barriers to social entrepreneurship in milk and beef production in Bangladesh**

There are several significant barriers hindering the growth of social entrepreneurship in milk and beef production in rural Bangladesh. These barriers include policy and legislative constraints, corruption risks, and challenging climatic conditions. Inadequate policies, regulations, and limited market access impede entrepreneurial initiatives. Rampant corruption undermines fair competition and equitable resource access. Additionally, unpredictable weather patterns and climate-related factors challenge livestock health and productivity. Addressing these barriers through policy reforms, anti-corruption measures, and climate-resilient investments is crucial for fostering sustainable development in this sector.

##### *5.4.1 Policy and legislative barriers*

The study reveals significant policy and legislative barriers in different regions of Bangladesh that hinder successful social entrepreneurship in milk and beef production. These barriers emphasize the importance of the entrepreneurial ecosystem's support in overcoming these barriers.

The study has identified policy constraints as a significant obstacle to developing social entrepreneurship in the milk and beef production sector. More adequate policies and regulations related to agricultural practices, land ownership, market access, and support services create a favourable environment for entrepreneurial initiatives. These barriers limit farmers' ability to innovate, invest, and achieve sustainable development, hindering the overall growth of social entrepreneurship in this industry.



Moreover, bureaucratic processes and instructions implemented by government officials further exacerbate the communication challenges between farmers and the government at the Upazila level. This communication barrier hampers effective engagement and collaboration, impeding the support that the entrepreneurial ecosystem can provide to milk and beef farmers.

The government needs to undertake comprehensive reforms to address these policies and legislative barriers. Implementing policy changes that create a more conducive environment for social entrepreneurship in milk and beef production will enable farmers to thrive. Additionally, enhancing infrastructure development, including establishing quality control labs, milk collection points, and robust supply chains, will increase farmers' income and production levels while ensuring household food security. Table 5.26 illustrates the indicative barriers generated from the study as perceived by the participants.

**Table 5. 26 Barriers to social entrepreneurship**

Interviewee Number	Area	Participants	Identifying barriers to social entrepreneurship in milk and beef production in Bangladesh	Comments, thoughts, and contribution
VS-1, Gob-1	North	DLO-1	a) Limited working people b) Policy barrier c) Climate conditions d) Too much bureaucratic process	a) Wants to increase food security through milk and beef production
VS-2, Shib-2	South	DLO-2	a) Limited transportations b) Political bias c) Limited financial budget d) Shortage of vaccines e) Lack of infrastructure development (Quality control Lab, Milk collection point, and cool supply chain)	a) Wants to reduce unemployment ratio
VS-3, Bor-3	South	DLO-3	a) Limited working people b) Policy barrier c) Climate conditions d) Too much bureaucratic process e) Lack of infrastructure development (Quality control Lab, Milk collection point, and cool supply chain) f) Financial assistance	a) Runs campaign and awareness building for food security and farm sustainability

Table 5.26 highlights the significance of providing small-scale farmers with adequate financial assistance and support services. Improving access to vaccination services, addressing resource limitations, and strengthening policies related to livestock processing,

food safety, and marketing are essential steps to overcome the barriers milk and beef farmers face.

By enacting supportive policies, enhancing infrastructure, and providing financial assistance, the entrepreneurial ecosystem can effectively support small-scale farmers, enabling them to thrive and contribute to food security.

Both NGOs and private organizations that participated in the study have also identified policy and legislative barriers as critical challenges that hinder social entrepreneurship. These organizations. These barriers (see table 5.27) include limited agricultural loan policies, bureaucratic processes, and inadequate regulations related to livestock processing, food safety, and marketing. Such policy constraints create hurdles for social entrepreneurs accessing resources, funding, and support for sustainable milk and beef production.

**Table 5. 27    Barriers to social entrepreneurship (NGOs and private organisations)**

Interviewee number	Area	Participants	Identifying barriers to social entrepreneurship in milk and beef production in Bangladesh
TMSS-1, Gob-1	North	NGO	1) Delinquent borrower b) Asymmetric information c) Limited financial budget d) No facilities for non-member
TMSS-2, Shib-2	South	NGO	a) Social mapping b) Delinquent instalment c) Climate condition d) Loan policy
GB-1, Gob-1	North	Private organization	a) Non-co-operation movement, strike, or Hartal b) Natural disaster c) Drug addicted client d) Limited policy for agriculture loan

Additionally, the study highlighted other barriers faced by the organizations. Delinquent borrowers, limited financial budgets, and climate conditions were common obstacles for NGOs and private organizations.

The impact of climate conditions, such as floods, cyclones, and droughts, affect farm operations, management, and household welfare, further exacerbating the challenges faced by farmers. Information asymmetry among loan borrowers was a specific barrier identified by NGOs, hindering the efficient distribution of loans. On the other hand, the private

organization faced issues related to non-cooperation movements, strikes, or Hartals, and drug-addicted clients, which added complexity to their operations.

*"As an NGO, we encounter various challenges due to legislative issues. Limited financial support hampers our efforts to provide extensive assistance to delinquent borrowers and farmers affected by climate conditions unexpectedly. Additionally, information asymmetry among loan borrowers creates hurdles in efficiently distributing loans. We operate our branch under certain conditions of the NGO bureau, but addressing these legislative concerns would allow us to serve better the communities we support."* TMSS-1, Gob 1

*"The legislative challenge is the lack of tailored policies or financial aid to address defaulting borrowers, restricted funding, and climate impacts. Without appropriate actions, supporting affected farmers becomes difficult, hindering our goal of a sustainable microfinance ecosystem."* TMSS-2, Shib 2

*"We face barriers such as delinquent borrowers, limited budgets, and climate impacts affecting farm operations and welfare. In order to address these challenges and foster a thriving microfinance ecosystem, legislative reforms are essential."* GB-1, Gob 1

Addressing these barriers requires concerted efforts to reform policies and regulations governing milk and beef production. Policymakers can design and implement supportive and conducive policies that streamline bureaucratic processes, enhance access to agricultural loans, and foster fair market practices. Moreover, there is a need for improved infrastructure development, such as quality control labs, milk collection points, and robust supply chains, to enhance farmers' income and production levels while ensuring household food security. The findings also highlight the importance of providing support and resources to farmers from the entrepreneurial ecosystem. NGOs, private organizations, and other stakeholders within the ecosystem play a crucial role in empowering farmers and overcoming obstacles. The entrepreneurial ecosystem can enable farmers to thrive and contribute to sustainable development in the milk and beef production sector by offering targeted support and tailored solutions.

Overall, the findings underscore the significant impact of policy and legislative barriers on social entrepreneurship in milk and beef production in Bangladesh. Addressing these barriers and providing comprehensive support to farmers is essential for fostering sustainable development in this sector. Policymakers and stakeholders in the entrepreneurial ecosystem must collaborate to create an enabling environment that empowers social entrepreneurs and small-scale farmers to succeed in this vital industry.

#### 5.4.2 Corruption risks

*“In my experience, corruption directly impacts farmers and their well-being. While the government vocally ensures safety, health, and hygiene through consumer protection laws, weak enforcement in practice allows unethical practices that compromise the safety of agricultural products, ultimately affecting both farmers and consumers negatively.” UMF*

The Corruption Perception Index (CPI) analysis underscores corruption risks in Bangladesh, which can adversely affect social entrepreneurship in milk and beef production as shown in Table 5.28.

**Table 5. 28     Corruption Perception Index, 2021-2022**

Country	CPI rank out of 180	CPI score out of 100	Score changes 2021 - 2022
Bangladesh	147	25	-1 (negative)
India	85	40	0
Pakistan	140	27	-1 (negative)

Source: CPI, 2022<sup>24</sup>

According to the CPI 2022, Bangladesh ranks 147th out of 180 countries with a low score of 25 out of 100, indicating a high perceived level of corruption within the public sector. This perception is further corroborated by the Global Corruption Barometer, where a staggering 72% of people in Bangladesh believe that government officials are involved in significant corruption. Corruption poses a significant barrier to social entrepreneurship, undermining fair competition and equitable access to resources and support services. For milk and beef production sector entrepreneurs, corruption can hinder their ability to access funding, secure

<sup>24</sup> Note. "From Corruption Perception," by CPI, 2022, *Corruption Perception Index*. (<https://www.transparency.org/en/cpi/2022/index/bgd>)

fair market opportunities, and navigate bureaucratic processes. The lack of transparency and overlapping administrative procedures can deter potential entrepreneurs from entering the sector.

*"As a social entrepreneur, I could not get an SME loan, and I encountered corruption and collateral issues, hindering fair competition and resource access. Unethical practices in loan applications resulted in high-interest rates of up to 28%, highlighting the need for reforms to foster affordable and accessible lending options."* SAL

*"I have not filed my loan application yet, as I lack the necessary paperwork. The presence of corruption at government banks has been a significant obstacle. Additionally, challenges with the business syndicate unethical practices in the marketplace have further hindered my progress."* SEK

The negative impact of corruption is not limited to Bangladesh; it also affects neighboring countries like Pakistan, which ranked 140th in the CPI 2022 with a score of 27, showing a decline in perception from the previous year. While India's score remained unchanged at 40, it still signifies a significant level of perceived corruption in the public sector. Addressing corruption risks is crucial for fostering an enabling environment for social entrepreneurship in food production. Policymakers, government officials, and stakeholders in the entrepreneurial ecosystem must work together to implement robust anti-corruption measures, increase transparency in regulatory and administrative systems, and promote ethical practices. By combating corruption, entrepreneurs can have equal opportunities to thrive, access resources, and contribute to sustainable development in the sector.

The CPI analysis emphasizes the importance of support from the entrepreneurial ecosystem for milk and beef farmers. By addressing corruption risks, stakeholders can create an environment that nurtures social entrepreneurship, empowers small-scale farmers, and enables them to succeed in the milk and beef production industry. Promoting fair and transparent governance practices will enhance social entrepreneurs' credibility and encourage more individuals to engage in sustainable food production initiatives, ultimately contributing to the country's economic growth and food security.

*"We aim to eliminate poverty by empowering hardworking individuals to improve their household income. We carefully select borrowers needing working capital and start-up funding to run successful farms. By providing loans for working capital, feed, sheds, and veterinary items, we equip them with the necessary resources and guidance for their livestock ventures." YC*

*"Expanding small-scale milk and beef farms, our organization seeks to improve performance, impact socioeconomic development, and alleviate poverty. We aim to disburse loans to at least five farms monthly, following NGO rules and providing agriculture loans without collateral, ensuring a corruption-free approach among our loan borrowers." TMSS-2*

The above evidence highlights the importance of an entrepreneurial ecosystem to address corruption risks and empower and support milk, beef, and other small-scale farmers. Promoting fair governance enhances social entrepreneurs' credibility, contributing to economic growth and food security goals.

*"We work on two critical issues: manufacturing and medical disease management, including artificial insemination. However, the negative impact of bureaucratic processes and less transparency can sometimes hinder our goal-setting efforts and services in the entire Upazila as a government job." DLO-2*

Table 5.29 reveal the significant impact of corruption issues on social entrepreneurship among farmers in Bangladesh. Participants from different regions reported facing barriers such as bribery to access loans, political pressure, and business syndication, adversely affecting their farm operations, income, and household food security. For instance, participant JEW highlighted the challenges of bribery to access loans and political pressure, which limited their ability to invest in farm improvements and expand production. Similar issues were reported by other participants (see Table 5.29) including FIR, ANI, SYD, and SHA, who faced corruption-related barriers that hindered their access to finance and resources.

**Table 5. 29 Indicative barriers as identified by farmer participants.**

Interviewee number	Area	Food security Score	Identifying the barriers to social entrepreneurship concerning milk and beef production in Bangladesh
FIR, Gob-1	North-West	Food security Score: 2.5 (struggling)	<b>Low yield-</b> a) Indigenous crop varieties b) Organic crops c) Low production <b>Access to finance-</b> a) Collateral for bank loan <b>Availability of skilled workers-</b> a) Shortage locally <b>Lack of family support-</b> a) Working capital and labor support
ANI, Gob-1	North-West	Food security Score: 2.8 (average)	<b>Access to finance-</b> a) Collateral for bank loan <b>Business syndicate-</b> a) Force to sell their set price <b>Availability of skilled workers-</b> a) Shortage locally
SYD, Gob-1	North-East	Food security Score: 4.0 (doing well)	<b>Education/training-</b> a) Limited applicants/year <b>Corruption/bribing-</b> a) Bribing access taking of loan <b>Political pressure-</b> a) Nepotism b) Farmer's family friend
SHA	South	Food security Score: 2.5 (struggling)	<b>Low yield-</b> a) Indigenous crop varieties b) Organic crops c) Low production <b>Access to finance-</b> a) Collateral for bank loan <b>Availability of skilled workers-</b> a) Shortage locally <b>Lack of family support-</b> a) Working capital and labor support
JEW	South	Food security Score: 2.5 (struggling)	<b>Access to finance-</b> a) Collateral for bank loan <b>Corruption/bribing-</b> a) Bribing access taking of loan <b>Political pressure-</b> a) Nepotism b) Farmer's family friend <b>Access to Market-</b> a) Poor market links

Corruption and bribery undermine fair competition, equitable access to resources, and transparent governance. Which impedes the development of social entrepreneurship initiatives in the milk and beef production sector. As a result, small-scale farmers struggle to improve their yields, production, and income, leading to food insecurity and financial constraints. Addressing corruption issues is crucial for promoting social entrepreneurship, enhancing the livelihoods and food security of farmers in Bangladesh. By fostering a fair and

transparent business environment, promoting accountability in loan distribution and agricultural policies, and mitigating corruption risks, the entrepreneurial ecosystem can create opportunities for farmers to thrive. Combating corruption will enable small-scale farmers, like participants JEW, FIR, ANI, SYD, and SHA, to access the necessary resources and support, leading to sustainable and inclusive growth in the milk and beef production sector.

### 5.4.3 Climatic conditions

The impact of climatic conditions on Bangladesh being one of the most vulnerable countries globally to climate change is highlighted in this study. Table 5.30 shows the country's high rank in the Climate Risk Index (CRI) indicating the severity of climate-related hazards and their adverse effects on socio-economic development. Over the period 2000 to 2019, Bangladesh experienced numerous climate-related fatalities, with 572.50 deaths per 100,000 inhabitants. The country also incurred substantial economic losses, amounting to 1860.04 million US dollars (PPP), equivalent to 0.41% of its GDP. These losses are attributed to various climate-related events, totaling 185 over the given period.

**Table 5. 30 Climate Risk Indicators, 2000-2019**

Country	CRI rank	CRI score	Fatalities	Fatalities/100 000 inhabitants	Losses in million US\$ PPP	Losses/unit GDP in %	Number of events (2000–2019)
Bangladesh	7	28.33	572.50	0.38	1860.04	0.41	185

*Source: CRI Index, 2019<sup>25</sup>*

The CRI Index underscore the pressing need for Bangladesh to implement robust adaptation and mitigation strategies to address the challenges posed by climatic conditions. Extreme weather events such as floods, storms, and heatwaves threaten food production, livestock health, and agricultural stability, directly impacting farmers' livelihoods in food production.

For social entrepreneurship in the milk and beef production sector to thrive, it is essential to address the climate-related vulnerabilities farmers face. Implementing climate-resilient practices, investing in infrastructure to withstand extreme weather events, and promoting sustainable agricultural methods are crucial steps toward building resilience and ensuring

<sup>25</sup> Note. "From Global Climate Risk," by CRI, 2019, *Global Climate Risk Index*. (<https://www.germanwatch.org/en/16046>)



food security for farming communities. The quotes from two participants are indicative of the experience of the majority of the study participants.

*"My challenge is that during natural calamities, particularly floods, the grassland sinks, leading to food shortages (cattle feed) for farmers and impacting their farms and income. I have informed higher authorities, and previously, food and agricultural organizations provided granular feed to affected farmers, but this time, we needed help assisting. Despite the challenges, I remain committed to finding solutions and seeking additional support to ensure farmers' well-being during such crises." DLO-1 (Gob 1).*

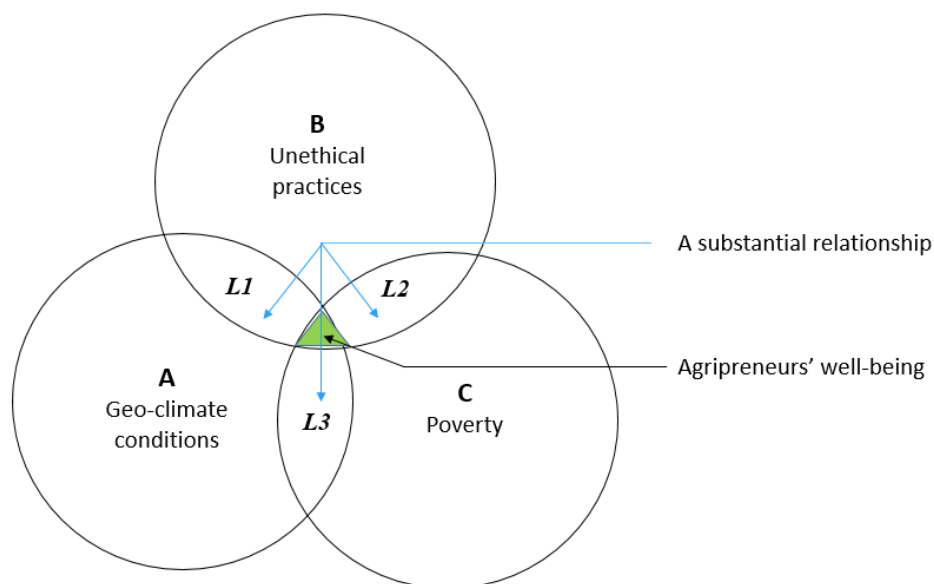
*"As a senior officer of Upazila of Livestock Office (ULO), I support social entrepreneurs in milk and beef production while addressing climate-related vulnerabilities. Climate-resilient practices and empowering farmers are vital for success and food security in rural areas, fostering a resilient agricultural landscape." DLO-3.*

As a matter of course, climatic conditions and their effect on the ecosystem cannot be considered in isolation. Bangladesh is affected by the action of neighboring countries making this a cross-territorial issue. For example, India's dams have considerably impacted various aspects of Bangladesh's livelihoods, agriculture, livestock, and overall human well-being. The construction of dams in India has reduced water flow downstream, significantly affecting irrigation and water availability for Bangladeshi farmers. During periods of heavy monsoon rains, the water flow from Indian rivers (particularly the Ganges and Brahmaputra) can surge significantly, resulting in widespread flooding in the low-lying areas of Bangladesh. This inundation has caused substantial damage to homes, infrastructure, and agricultural fields. The extent of the damage varies from year to year and may also depend on the effectiveness of water management and flood control measures implemented by both India and Bangladesh.

Situated in South Asia, Bangladesh experiences diverse geo-climate conditions that significantly influence its physical and environmental aspects. Factors such as geography, proximity to the Bay of Bengal, and the presence of the Himalayas contribute to its subtropical monsoon climate, characterized by distinct seasons, high temperatures, and heavy

rainfall (BANBEIS, 2019). Summers are hot and humid, while winters are mild, with average temperatures ranging from 25°C (77°F) to 35°C (95°F) in summer and ten °C (50°F) to 20°C (68°F) in winter. The monsoon season, from June to September, brings substantial rainfall, often leading to floods in certain regions. Furthermore, the southwest monsoon winds from the Bay of Bengal bring significant rainfall, which is vital for agriculture and water availability. These geo-climate conditions profoundly impact agriculture, the economy, and society, with extreme weather events posing challenges and increasing the risks of poverty.

Ecosystems and biodiversity, including the Sundarbans mangrove forest, face additional challenges due to climate patterns, rising sea levels, and saline water intrusion. Understanding and adapting to these conditions are crucial for sustainable development, disaster preparedness, and effective climate change mitigation to safeguard the well-being and resilience of communities (BANBEIS, 2019). The challenges posed by geo-climate conditions, unethical practices, and poverty have a negative impact on the development and well-being of the agripreneurs, as depicted in Figure 5.4 where the relationship between geo-climate conditions, unethical practices, and poverty is illustrated.



**Figure 5. 4 Substantial relationship**

Despite water-sharing treaties between India and Bangladesh, such as the Ganges Water Sharing Treaty, concerns have been raised due to instances of non-compliance by India and a need for more action. Ensuring effective water resource management and equitable distribution is crucial for fostering cooperation between the two countries and resolving

disputes related to share water resources. The Delta zone in Bangladesh is a vast and low-lying region formed by the convergence of the Ganges, Brahmaputra, and Meghna rivers, renowned for its fertile soil and rich biodiversity. However, this area is highly susceptible to seasonal flooding, particularly during monsoon seasons, which poses significant challenges for local communities and agriculture. Therefore, concerted efforts to manage and mitigate the impacts of flooding in this delta region are vital for ensuring Bangladesh's well-being and sustainable development.

Climate issues are therefore best tackled in tandem with other geographic regions in order that food systems are also protected. The findings emphasize the importance of support from the entrepreneurial ecosystem for farmers. By implementing climate-smart initiatives and providing access to resources and knowledge, the entrepreneurial ecosystem can significantly enable farmers to adapt to climatic challenges, enhance their production, and achieve sustainable income through social entrepreneurship in milk and beef production.

#### *5.4.4 Outcomes from the analysis*

Outcomes from the analysis indicate that farm-based social entrepreneurs, representing small-scale milk and beef farmers in Bangladesh, face significant barriers that hinder their operations and livelihoods. These barriers can be broadly categorized into three main groups. The first category encompasses challenges impacting small-scale farms, such as limited access to finance, poor market access, political pressure, low yield, and the presence of business syndicates. These obstacles adversely affect farm operations, household income, food security, and assets, posing considerable barriers to sustainable development in the agricultural sector.

The second category involves farmers being constrained to sell their produce at predetermined prices, reducing their income potential and hindering farm production. This limitation in earning capacity hampers their ability to improve food security and perpetuates the cycle of poverty in rural areas. The third category includes compound risks arising from corruption and climatic conditions. Farmers encounter corruption when accessing financial services, licenses, veterinary and livestock support, and artificial insemination services. Additionally, they struggle with climate-related events, such as land and crop damage, disruptions to farms and grasslands, and the spread of diseases. These compound risks further

challenge milk and beef farmers' ability to sustain their operations, leading to multidimensional poverty in the communities.

Figure 5.5 visually represents the interconnected nature of these barriers and compound risks, emphasizing the need for a comprehensive approach to address them and promote sustainable development in the agricultural sector. The diagram highlights the interdependence of various factors, including policy and legislative barriers that impact food security and livelihoods in rural areas.

**1. Controllable**

*Policy and legislative barriers*

- Complex bureaucratic environments
- Rules of law and enforcement authority
- Effective checks and balances
- Judicial independence
- Public services
- Transparencies regulatory and administrative systems
- Accountability and reporting

**2. Controllable**

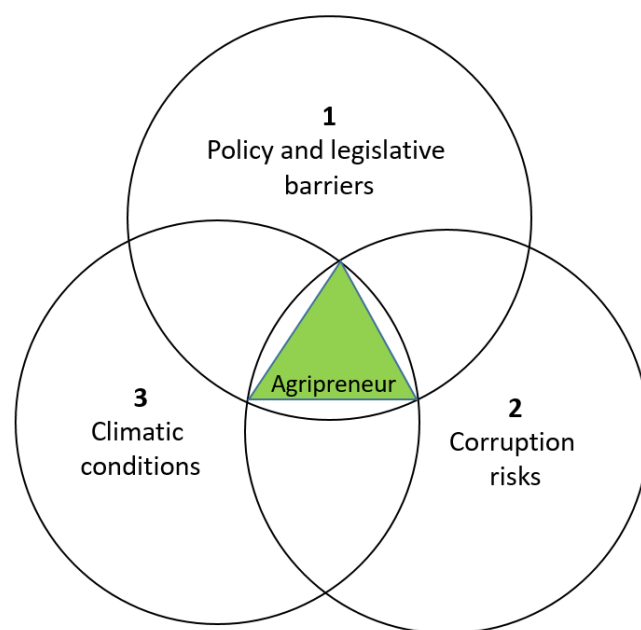
*Corruption risk (Entrepreneurial ecosystem)*

- Policy
- Finance
- Culture
- Business support
- Human capital
- Markets

**3. Uncontrollable**

*Climate conditions*

- Floods/downpour from India
- Top soil erosion
- Increasing salinity
- Bio-diversity and ecosystem
- Plant disease (food/fodder)



**Figure 5. 5     The significant barriers to food production, food security, and entrepreneurship persist.**

The study underscores the importance of adopting strategies that promote sustainable farm production, diversify income sources, and reduce multidimensional poverty in rural livelihoods. Addressing policy and legislative issues, improving quality control measures in rural areas, and fostering transparent bureaucratic processes and climate adaptation strategies are vital to building resilience in small-scale milk and beef farming operations.

While the analysis reveals the decline of traditional rural farming and the challenges faced by farm-based social entrepreneurs, it also suggests that the significant barriers and compound

risks affecting farmers have far-reaching implications for farming operations and household food security, indicating that the current agripreneurial ecosystem may not effectively address these complex issues. Therefore, an integrated approach is necessary to tackle these barriers and mitigate risks, addressing these challenges will support milk and beef farmers and foster sustainable development in Bangladesh's agricultural sector.

#### *5.4.5 Triangulation process*

The study's findings highlight the significance and effectiveness of the triangulation process in research. By utilizing multiple data collection methods and sources, the study enhanced its findings' credibility, validity, and reliability. The incorporation of interviews, surveys, observations, and secondary data enabled a comprehensive analysis of sustainable production, income, and expenses among milk and beef farmers in three districts over the past five years.

Through the triangulation process, the findings support the notion that sustainable production is indeed linked to sustainable income. Creating improved household food security, income diversification, and poverty reduction in rural areas at the individual and community levels. This strengthens the overall findings and underscores the importance of the interplay between sustainable production and income in enhancing the welfare of farmers and their communities. By employing the four main types of triangulations: data triangulation, methodological triangulation, investigator triangulation, and theoretical triangulation, the study ensured consistency and support for its research results. The use of diverse data sources, including primary data from interviews and secondary data from various formats, facilitated a comprehensive analysis and minimized biases that may have arisen from relying solely on one data collection approach.

In conclusion, the triangulation process proved to be a valuable and practical research approach in this study, enabling robust and reliable conclusions. The findings offer important insights into the relationship between sustainable production, income, and household welfare among milk and beef farmers, emphasizing the potential for sustainable income to impact food security and poverty reduction in rural areas positively. The successful application of the triangulation process demonstrates its significance in enhancing the quality and credibility of research findings.

## **5.5 Chapter summary**

This chapter presents the key findings from the analysis of Bangladesh's current food security situation, specifically emphasizing critical elements such as availability, access, utilization, and stability. The study thoroughly examines sustainable food production practices contributing to farmers' income sustainability, including in-depth investigations into livestock management, income diversification, and sustainable production methods within the entrepreneurial ecosystem.

A central aspect highlighted in the findings is the pivotal role of farmers in the agriprenurial ecosystem, where they actively function as food producers, employment providers, and facilitators in the market. Additionally, the chapter addresses the identified barriers to social entrepreneurship in milk and beef production, focusing on political and legislative challenges, corruption risks, and climate conditions.

In order to strengthen the credibility, validity, and reliability of the qualitative research, the study employed a triangulation process to synthesize multiple data sources and methodologies. The significant findings underscore a substantial and meaningful relationship between sustainable production, income, and household welfare among milk and beef farmers, suggesting potential avenues to enhance food security through these sustainable practices.

The chapter concludes by offering essential insights from the findings and their implications for further research and policy considerations concerning food security and sustainable production in Bangladesh. These findings hold the potential to shape and direct future efforts towards fostering a more secure and sustainable production in the country.

## **CHAPTER SIX**

### **DISCUSSION AND CONCLUSION**

The discussion of findings underscores the crucial role of farmers in ensuring Bangladesh's food security as food producers, employment providers, and market facilitators. The Global Food Security Index for 2021 and 2022 reveals that nearly half of the population experiences food insecurity (GFSI, 2021). Sustainable practices, such as livestock management and income diversification, are essential for farmers' income sustainability (Mair & Marti, 2006). Urgent attention is needed to address milk and beef production barriers, including political and legislative challenges, corruption risks, and climate conditions. This study highlights a significant positive relationship between sustainable production, income, and household welfare, offering opportunities to enhance food security. Supporting marginalized farmers empowers them, promotes sustainable livelihoods, and mitigates multidimensional poverty. In order to build a more resilient and prosperous food production system, comprehensive strategies prioritizing sustainable practices and supporting farmers are required.

#### **6.1 The current state of food security in Bangladesh**

This study examines Bangladesh's current state of food security, focusing on the Global Food Security Index for 2021 and 2022. Food security means access to sufficient, safe, and nutritious food for maintaining an active and healthy life (FAO, 2018; Sen, 1981). This study analyzes four key elements of food security: availability, access, utilization, and stability. Bangladesh is ranked 84th out of 113 countries in the 2021 based on the Global Food Security Index, with an overall score of 49.1 out of 100, indicating that nearly half of the population faces food insecurity. In the 2022 index, Bangladesh ranks 115th out of 171 countries, with a crisis level score of 3.03 out of 10.0, highlighting the severity of the crisis and inadequate food access (GFSI, 2022). Additionally, this study finds that food affordability in Bangladesh has an average score of 10.0 to 19.9 out of 100 on the hunger index scale, suggesting that 51.83% of the population can afford food, while the remaining 48.17% requires greater affordability (GHI, 2021).

This study highlights the critical importance of sustainable production in achieving food security goals. It emphasizes enhancing household food security to address hunger, vitamin and mineral deficiency, and overall well-being. The influence of natural disasters and human-made shocks (such as geo-climate, corruption) can disrupt sustainable production and

exacerbate food insecurity. A comprehensive approach is required to combat these challenges, promoting sustainable production practices, and fostering resilience in the face of various shocks, ultimately working towards a more food-secure future (Hoq et al., 2021; Islam & Khan, 2018).

In Bangladesh, substantial milk production is shortfall of 5.62 million metric tons compared to consumer demand. Additionally, meat production exceeding demand by 0.046 million metric tons underscores the need for strategic interventions to bridge production gaps and ensure a more balanced and sustainable food supply (DLS, 2018). Limited dietary intake impacts health of families due to their lack of nutrient intake in USA (USDA, 2013). This study supports the findings of USDA (2013) and adds that dietary deficit raises concerns about potential impact on food security and nutrition, particularly among rural populations in Bangladesh. Hence, food security, in the form of dietary intake, is a serious global issue in both developed and emerging economies.

There is a significant food access issue in Bangladesh (GFSI, 2022). Natural disasters and human-made shocks affect poverty, income disparity, and vulnerability, influencing food access (Shah et al., 2022). Engaging various stakeholders becomes crucial to enhancing the food system, particularly for vulnerable groups (Khanal et al., 2020). Recognizing food access as a human right, the government is pivotal in ensuring continuous and sufficient access to the national food supply, particularly during crises (UNEP, 2009).

Bangladesh's Food Security Index score falls below the global average of 68.0, with the country scoring below average in all indicators except for Nutritional Standards (GFSI, 2022). This highlights the importance of addressing dietary diversity and micronutrient availability to bolster food security, emphasizing the need for targeted interventions. Policymakers can leverage these valuable insights to formulate strategies that optimize nutritional benefits and promote equitable food utilization in the country.

## **6.2 Sustainable farming production practices for sustainable income**

The research focused on farmers' livestock management and sustainable food production practices, found that it fosters income diversification and resilience (Al Mamun et al., 2011; Muniruzzaman, 2013). These practices contribute to a robust food system, benefiting communities (Dzingirai et al., 2021; Fitz-Koch, 2018). Key potential for improvement in



sustainable approaches is to address livestock production deficits (LPI, 2019). This research adds that integrating responsible livestock management and sustainable practices can enhance income diversification and promoting food security in Bangladesh.

Sustainable food production practices play a crucial role in enhancing household income levels and food security. This research adds to the existing body of knowledge that lower household income has limited access to necessary nutrition, which consequently impacts food security of that household (BBS, 2018; Slater et al., 2009). The key contribution in this research is the vital link between sustainable production, income, and food security. Crossbreeding cows has come through as one of the key factors in food production, which positively impacts household income and food security. This study contributes to the literature on sustainable production where it is clearly stated there needs to be a balance of social, economic, and environmental goals to sustain the benefits from this production (Colin, 2019; Al Mamun et al., 2011).

Income diversification is crucial for farmers' resilience and livelihoods in Bangladesh's agriculture sector. Diversifying income sources reduces reliance on a single stream, providing stability amidst economic fluctuations and external risks (Kabir et al., 2021). The findings in this study highlight challenges faced by farmers, including market fluctuations, diseases, and weather conditions, leading to multidimensional poverty. To address these challenges, it is suggested to promote agripreneurship and sustainable practices to achieve the SDG goals of poverty eradication and food security.

Stable business environment is important (Isenberg, 2011; Mazzarol, 2014a) and this study adds to existing body of knowledge that the government's commitment to promoting sustainable production practices in Bangladesh is crucial. The government supports farmers and women entrepreneurs through initiatives such as free seeds, fertilizers, livestock, vaccines, and essential resources, fostering increased production and household food security. The emphasis on animal healthcare services and crossbreeding further enhances livestock production and income (Pacheco et al., 2010) and this also applies to rural Bangladesh. Additionally, access to working capital is essential in sustaining small-scale farming and the government and NGOs play a significant role in gaining access to it.

### **6.3 The role of farmers in the agripreneurial ecosystem**

Farmers' diverse contributions as market facilitators, risk-takers, and significant food producers are important factors in developing and sustaining agripreneurial ecosystem in Bangladesh. Their cultivation of high-value crops and income diversification create employment opportunities and improve food security while addressing inadequate resources (Al Mamun et al., 2011). Moreover, farmers play a pivotal role in poverty reduction and market facilitation, making them indispensable for economic development. Farmers in Bangladesh play a crucial role in producing food and reducing rural poverty, as many rural communities are facing deprivations in health, education, and standard of living. Empowering farmers and supporting their efforts in adopting innovative technologies can positively impact food security and socio-economic development in Bangladesh.

Farmers also serve as market facilitators within the agripreneurial ecosystem in Bangladesh. The findings reveal that farmers actively collaborate with NGOs and private organizations to bridge the gap between producers and markets. Farmers act as intermediaries, ensuring their agricultural products reach consumers at the right time and price. They also contribute to value addition, packaging, and quality control, essential aspects of effective marketing. The farmers in the North-West and North regions play an active role in market facilitation, providing valuable support to fellow farmers and contributing to improved market access and sustainable income generation. The involvement of social entrepreneurs, including NGOs and private organizations, further amplifies the impact of farmers' market facilitation efforts, enabling them to access broader markets and secure better prices. This collaborative effort strengthens market facilitation, supporting sustainable food production and enhancing food security in Bangladesh.

The findings indicate that Bangladesh's entrepreneurial ecosystem related to food security creates a supportive environment for food-related entrepreneurship. As key stakeholders in this ecosystem, farmers serve as crucial market facilitators, connecting agricultural produce to consumers and markets. Their active involvement in promoting sustainable farming practices and coordination contributes to improved market access, increased income, and enhanced food security outcomes for small-scale farmers. Farmers also serve as employment providers and market facilitators within the agripreneurial ecosystem. The collaborative efforts between farmers, NGOs, private organizations, and government agencies further reinforce the role of farmers as key contributors to enhancing food security in the country.

The study highlights that social entrepreneur, including farmers, benefit from a supportive local entrepreneurial ecosystem, which provides access to resources, finance, knowledge, and networks. This ecosystem enables social entrepreneurs to implement innovative solutions, scale initiatives, and impact sustainable food production and food security in the country. The study underscores the criticality of such ecosystems in empowering farmers and other social entrepreneurs to address food security challenges effectively.

#### **6.4 Barriers to social entrepreneurship in milk and beef production in Bangladesh**

While farmers are crucial in developing the agripreneurial ecosystem in Bangladesh, they face a number of challenges, including policy and legislative constraints, corruption, and challenging climatic conditions, impede entrepreneurial initiatives and equitable resource access. Addressing these challenges through policy reforms, anti-corruption measures, and climate-resilient investments is essential for fostering sustainable development in the sector.

Corruption is one of the key challenges that creates risk for farmers and their ability to engage in social entrepreneurship in rural Bangladesh. The Corruption Perception Index (CPI) analysis indicates a low score of 26 out of 100 for Bangladesh, reflecting a high perceived level of corruption within the public sector (CPI, 2022). Corruption restricts fair competition and equitable resource access, hindering entrepreneurs' ability to secure funding, fair market opportunities, and navigating bureaucratic processes. Farmers face bribery and political pressure, hindering their access to finance and resources and ultimately affecting their farm operations, income, and household food security. Addressing corruption through anti-corruption measures, increased transparency, and ethical practices is essential for fostering an enabling environment for social entrepreneurship and sustainable development in the sector.

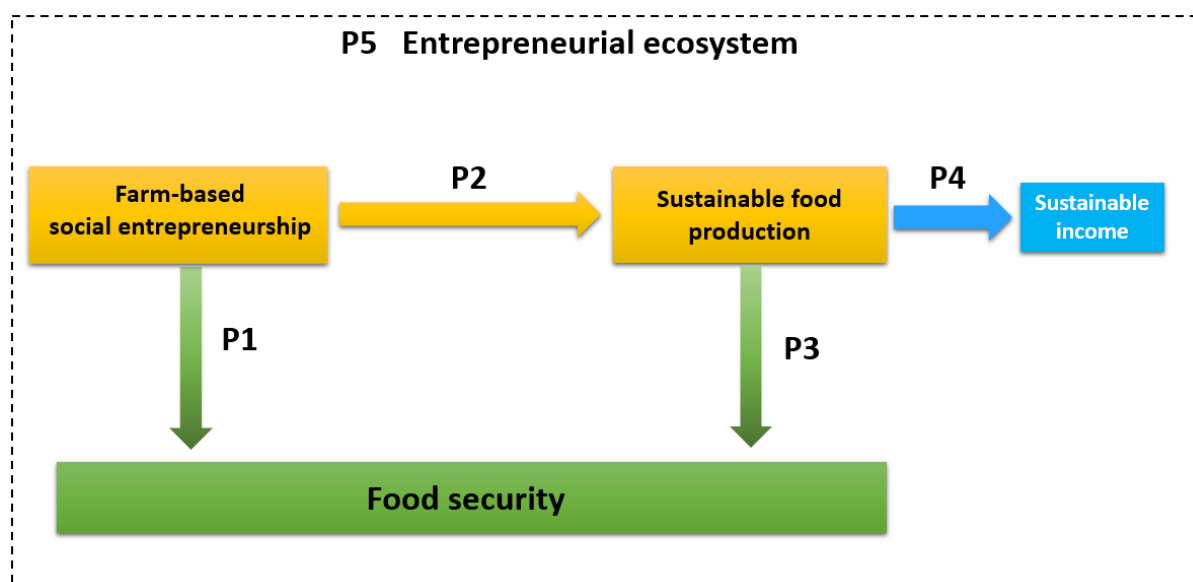
Climatic conditions also present serious challenges for farmers in Bangladesh. The country's vulnerability to climate change, as indicated by its high ranking in the Climate Risk Index (CRI, 2019), underscores the severity of climate-related hazards and their adverse effects on socio-economic development. Extreme weather events such as floods, storms, and heatwaves directly threaten food production, livestock health, and agricultural stability, posing challenges to farmers in the milk and beef production sector. In fostering social entrepreneurship in this sector, addressing the climate-related vulnerabilities farmers face is

crucial. Implementing climate-resilient practices and promoting sustainable agricultural methods are essential to build resilience and ensure food security for farming communities.

Policymakers, NGOs, and private organizations play a crucial role in empowering farmers and providing tailored solutions to address the obstacles. Collaborative efforts among stakeholders are vital for enhancing food security and creating a supportive environment for social entrepreneurs. This can help to foster positive outcomes in Bangladesh's agricultural landscape.

## 6.5 Conceptual model and propositions

The initial conceptual framework for this study presented in Figure 3.1 provided a clear link between social entrepreneurship, sustainable food production and food security. This helped to develop supportive entrepreneurial ecosystem (Stuart & Sorensen, 2007). Existing literature argues that social entrepreneurs need marketing channels, engagement of localized learning, product and market knowledge, the structure of entrepreneurship, strategies, and technical skills (Miller & Bound, 2011; Roper & Hart, 2013). All these factors should then increase household income and contribute to food security.



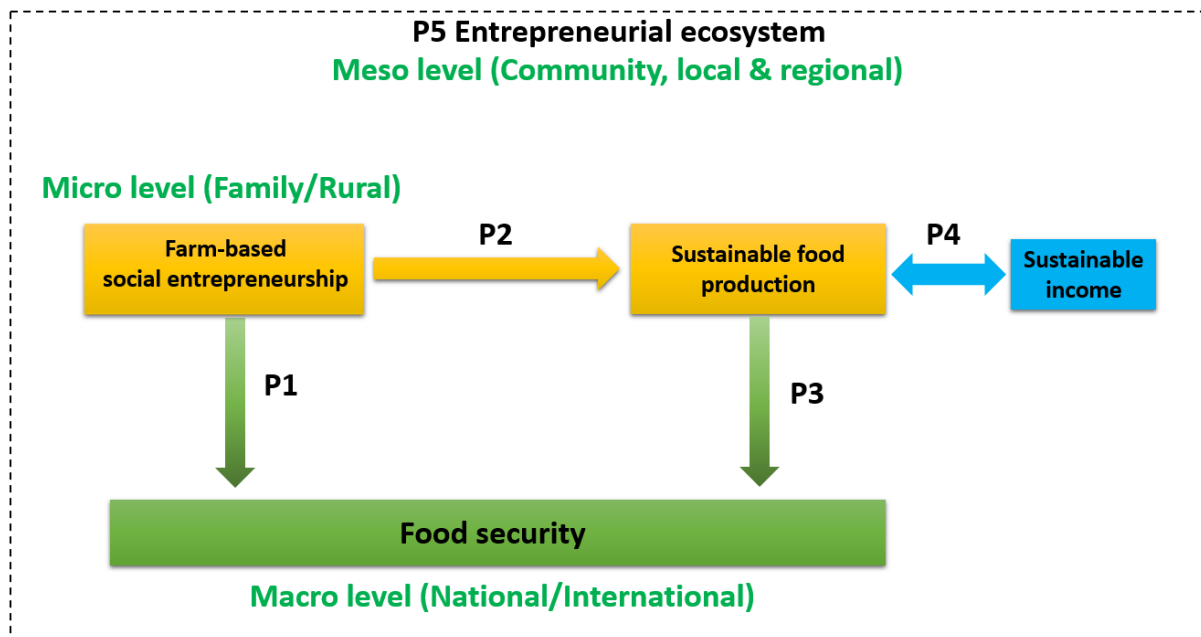
**Figure 3.1 Conceptual framework**

Propositions 1, 2 and 3 developed in this study were supported and propositions 4 and 5 were only partially supported. For the food security to be enhanced in Bangladesh, the farmers, who are social entrepreneurs, require supportive ecosystem. Proposition 1 states "Farm-based social entrepreneurs enhance food security by developing innovative solutions to address issues in the food system in Bangladesh." Farmers play a crucial role as social entrepreneurs in Bangladesh agriculture sector. They have the knowledge and skills to innovate through livestock management, and collaboration with NGOs. The involvement of NGOs allows farmers to control their produce supply, access to the market and prices, which are crucial for building a strong entrepreneurial ecosystem (Maroufkhani et al., 2018).

Furthermore, through NGOs, farmers can influence trade policy and to some extent navigate high levels of corruption, which is a serious barrier for building and sustaining the infrastructure necessary to enhance food security. This is in line with proposition 2 that states *"Farm-based social entrepreneurship is likely to enhance sustainable food production and hence promote food security in Bangladesh."* Proposition 3 states *"Food security is influenced by sustainable food production by milk and beef farmers in Bangladesh."* This proposition is strongly supported, and the findings demonstrate the positive impact of sustainable production practices on household income levels and food security. Food production practices can be supported by livestock management and diversification of income. Having multiple streams of income (e.g. vet clinics, aquaculture, sheep farming etc.) allows farmers to re-invest in their farming system.

Overall, there is clear evidence that sustainable food production has a positive impact on income and food security. However, the lack of control around the impact of climate change and high levels of bribery has a negative impact on food production and food security. Hence proposition 4 *"Sustainable food production is likely to promote sustainable income for farm-based social entrepreneurs through diversification and hence, enhance food security in Bangladesh."* was not fully supported.

In Figure 6.1, a two-directional relationship is depicted, where sustainable production leads to sustainable income and vice versa, ultimately contributing to food security. The revised food security model, as illustrated in Figure 6.1, emphasizes the interconnections between these components, denoted as P4.



**Figure 6.1 Revised food security model**

The above figure shows the intricate relationships within farm-based social entrepreneurship, displaying its influence on sustainable food production and income at micro, meso, and macro levels. The entrepreneurial ecosystem is visually underscored as a crucial link, facilitating connections between these pivotal constructs, and emphasizing an integrated approach to promote long-term sustainability and food security. The logical flow in the model accentuates the dynamic interactions among sustainable production, income generation, and overall food security.

While research suggests that supportive entrepreneurial ecosystem requires six functioning components: finance, culture, policy, support, human capital, and markets (Isenberg (2011); Maroufkhani et al, 2018). This study extends the discussion on entrepreneurial ecosystem by identifying climate change as another element that is part of entrepreneurial ecosystem. While geographic areas have been mentioned before as a factor that needs to be considered when examining entrepreneurial ecosystems (Neumeyer & Santos, 2018), the impact of climate change has not been investigated as part of the entrepreneurial ecosystem.

This is crucial for this study because Proposition 5 states that "Supportive local entrepreneurial ecosystems in Bangladesh are likely to help social entrepreneurs succeed in enhancing food security." This proposition is not fully supported, because for the entrepreneurial ecosystem to be fully supportive, its key elements need to function well

together. Looking at the system holistically, corruption in Bangladesh has significantly impacted access to finance and markets, policy development, and mitigating negative impact of climate change on farm development. This in fact, hinders the food production, despite farmers having the knowledge and skills gained through collaboration with NGOs, to become social entrepreneurs and enhance food security in Bangladesh.

## **6.6 Chapter summary**

This chapter presents a comprehensive discussion of the study's findings, focusing on the critical role of farmers in ensuring food security in Bangladesh as food producers, employment providers, and market facilitators. It highlights the country's current state of food security and the urgent need to address barriers hindering social entrepreneurship in milk and beef production. The analysis underscores the positive impact of sustainable food production practices on household income levels and food security. The study emphasizes the interconnectedness of social entrepreneurship, sustainable food production, income, and food security within a supportive entrepreneurial ecosystem. The chapter also validates the propositions presented in the conceptual framework, with some propositions strongly supported by data and others requiring additional evidence for full validation. The study underscores the importance of sustainable practices and supportive ecosystems in promoting food security, fostering socio-economic development, and reducing poverty in Bangladesh's agricultural sector. The conceptual framework provides a foundation for future research and policy initiatives to enhance the country's food security and sustainable development. However, more specific evidence and case studies are needed to strengthen some propositions fully and comprehensively explore the relationships between key constructs in the context of social entrepreneurship, sustainable food production, and food security in Bangladesh.

## CHAPTER SEVEN

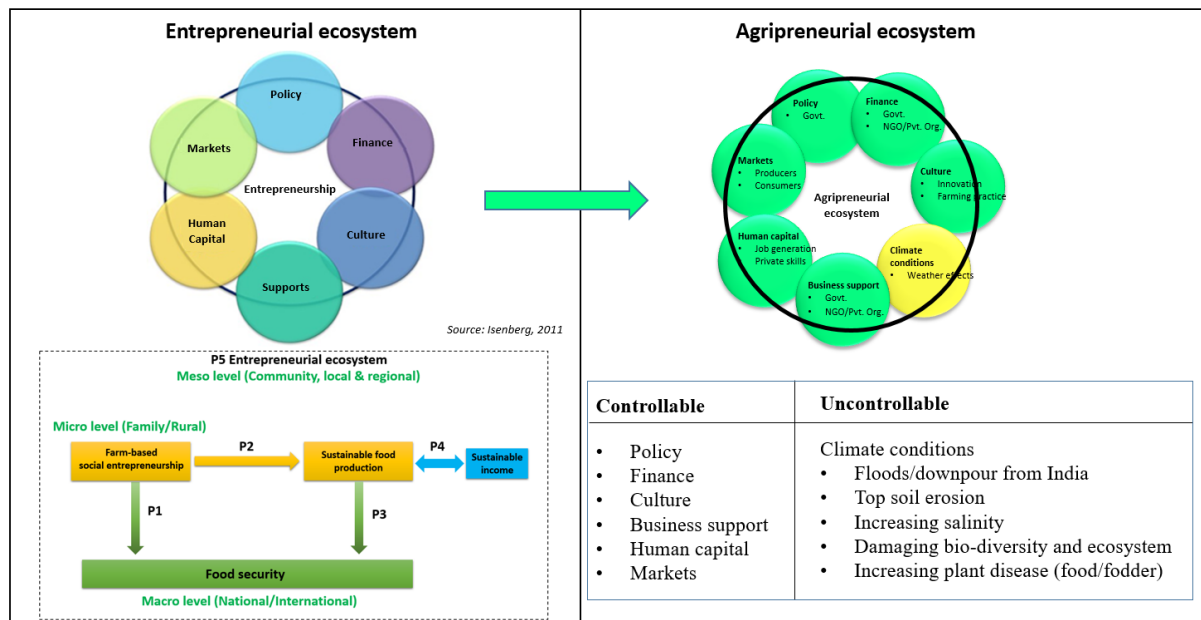
### CONTRIBUTIONS

This chapter summarizes the study's theoretical, methodological, and practical contributions. It also acknowledges the limitations of the research and offers recommendations for future studies.

### 7.1 Contributions

#### 7.1.1 Theoretical contribution

This study contributes to the literature on social entrepreneurship and entrepreneurial ecosystem. The key theoretical contributions of this study are twofold. First, social entrepreneurs operate within an agripreneurial ecosystem in developing country context, Bangladesh. Agripreneurial ecosystem, as opposed to traditional entrepreneurial ecosystem, includes climate change because farmers are largely dependent on the climate conditions and geo-climate factors because the policy development, government and corruption can significantly impact food production. This contribution is captured in Figure 7.1.



**Figure 7.1 Theoretical Contribution**

The study examines the elements of the entrepreneurial ecosystem to explain the role of farm-based social entrepreneurs in leading food security and social entrepreneurship, playing a role as mission-driven businesses (Massetti, 2008). The farmers require six elements of the



entrepreneurial ecosystem to play a vital role in the agriculture ecosystem. For example, access to finance is essential to starting up and operating small-scale farms as farmers face financial constraints. In addition, they require business support, policy, culture, human capital, and markets (Isenberg, 2011; Mazzarol, 2014a) to promote social entrepreneurship and increase household food security. The study links the theory with sustainable production and income, which signify the originality and addition of new elements.

The second contribution is the role of farm-based social entrepreneurs, who work as market facilitators, food producers, and job providers in promoting food security. The farmers' role as social entrepreneurs depends significantly on their collaborations with NGOs that help them control their production and prices. It also allows them to access broader markets and financial resources. This research is among the first to consider social entrepreneurship as an essential vehicle in solving food security problems at an individual, community, and regional level. This contributes to a better understanding of how social entrepreneurship contributes to battling food security challenges. There is a significant link between the agripreneurial ecosystem, social entrepreneurship, and food security, which is crucial in developing a functioning entrepreneurial ecosystem for the farmers to operate it. Collaboration among key stakeholders such as farmers, NGOs, banks, and governments can help to understand better the challenges that farmers face and develop clear strategies.

#### *7.1.2 Methodological contribution*

This study's methodological contribution lies in the practical experience through an application, research strategy, interpretive approach, and techniques applied to collect data on the research site. Thus, this practical experience shall be helpful for a similar study or if it is related to food security and social entrepreneurship in the developing country context.

#### *Conducting interviews over Zoom*

The study utilized semi-structured, in-depth interviews conducted via Zoom with the assistance of a research assistant living in one of the research sites. They used cutting-edge technology and robust network connections in rural areas allowing for the successful use of VoIP technologies like Zoom. Since 19 February 2018, 4G networking services have covered most locations, and on 12 December 2021, 5G networking services started in Bangladesh (Sultana, 2022). Using Zoom for interviews proved convenient, cost-effective, and less time-consuming in rural areas, eliminating the need for physical travel to the research sites. There

were no issues with electricity or interruptions of networking services during the interview sessions. Additionally, there was a significant interaction between the participants and the interviewer during the Zoom interviews.

The help of a Research Assistant under certain study conditions is a methodological contribution to this study. This has been valuable as the researcher was unable to travel during the data collection phase due to closed borders as a result of COVID-19. A voluntary research assistant from the research site (Bangladesh) was recruited to work with the team to gain practical experience for their career development and broader benefits. With 18 years of field experience in livestock services and being a selected trainer of DLS (Department of Livestock Service), the research assistant possessed considerable knowledge and expertise. The assistant accepted the terms and conditions, followed the data protection act and rules of Canterbury Christchurch University, New Zealand, and signed the consent form to take necessary steps and assist in conducting and recording audio/video interviews through Zoom on the research site in Bangladesh. The research assistant provided a significant advantage in this study as they understood the local dialect and more sensitive indications from the participants. The research assistant's duties included assisting with research setup, recruiting participants, planning interview schedules, rescheduling, conducting interviews, and transcribing and coding raw data. Additionally, the research assistant supported completing the data collection process through various additional tasks. He also accompanied the researcher during the in-person follow up site visits when the borders opened.

A field trip was made to visit the participants on their farms. During this trip, updated reports were collected for third-cycle analysis. Additionally, government officials were re-interviewed, providing further information. The reports collected during the field trip are included in the secondary data section. Below is a montage of images from the post-interview field trips.





*Study participants during follow-up visit (photo inclusion consent granted)*

The post-interview field trips confirmed the data and information collected during the second data collection phase. The above photo montage was taken during the follow-up get together with the Zoom interviewees when the researcher travelled to Bangladesh when borders opened.

*Methodological contribution: Advancing research practices for contextually rich studies.*

This study's methodological contribution extends beyond the innovative use of Zoom interviews and the engagement of a research assistant, encompassing a spectrum of strategic choices that elevate the study's rigour and relevance. Adopting participatory action research principles, where participants actively collaborate in shaping the research process, establishes a dynamic and contextually grounded framework. This collaborative approach ensures that the study resonates authentically with the lived experiences of those directly involved, enhancing the validity of the findings. Additionally, the incorporation of member checking, allowing participants to validate preliminary findings, underscores the commitment to reflexivity and participant-centred ethics. The study's responsiveness to external challenges, such as the COVID-19 pandemic, showcases methodological adaptability by recruiting a local research assistant and leveraging virtual communication tools like Zoom.

Furthermore, including a field trip, during which updated reports were collected for third-cycle analysis and government officials were re-interviewed, adds a longitudinal and comprehensive layer to the research. The photo montage from post-interview field trips serves as a visual testament to the study's authenticity and aligns with ethical considerations,

reflecting a participant-centric approach. Collectively, these methodological contributions establish a framework for conducting research in developing country contexts, setting a precedent for robust, inclusive, and contextually rich studies in food security and social entrepreneurship.

### *7.1.3 Practical contribution*

The study primarily centres on exploring the practical and managerial implications of food security in less developed economies, focusing on Bangladesh. Its main objective is to support policies and development initiatives that foster the growth of small-scale milk and beef farms in rural areas. These farms have demonstrated their effectiveness as significant contributors to poverty reduction, increased employability, and improved food security strategies. In order to achieve success in this regard, the study suggests that public-private partnerships, non-profit organizations, and private investors can collaborate and employ innovative approaches, technology advancements, and effective marketing strategies at the domestic level.

Enhancing milk and beef production through small-scale farming in rural areas can contribute to individual, community, and regional income diversification. Social entrepreneurship plays a crucial role in facilitating this process. However, several challenges can be addressed, including policy barriers, climate conditions, and corruption risks, which can significantly impact farm operations and financial outcomes. Thus, specific actions are required regarding policy, practice, theory, or further research regarding small-scale milk and beef farms in developing countries like Bangladesh.

Food consumption patterns vary significantly across countries and are influenced by factors such as national awareness, food campaigns, and the activities of non-profit organizations and government agencies. Additionally, cultural, geographical, and economic factors, including production, supply, demand, land availability, labour, capital, and entrepreneurship, play a pivotal role in shaping food consumption practices. Therefore, service providers must help farmers by emphasizing sustainable production to generate continuous income streams that ultimately contribute to national food security. Regarding food security, revising and updating legislative measures to ensure the safety and quality control of perishable food items such as milk and beef is crucial. Such revisions can contribute to increased farm income from

the export market, subsequently impacting household food security and welfare at the individual, community, and regional levels.

Unethical practices in the context of Bangladesh encompass actions or behaviours that are considered morally wrong or socially unacceptable. These practices can manifest in various forms, such as corruption, bribery, human rights abuses, environmental exploitation, or unfair business practices (Kabir et al., 2021). Addressing and combating unethical practices are vital for fostering a just and equitable society, promoting transparency, and upholding integrity and social responsibility principles (Olabiyi, 2022). Therefore, efforts to raise awareness, enforce legal frameworks, and promote ethical conduct play a crucial role in creating a more ethical and sustainable Bangladesh.

In conclusion, the diverse geo-climate conditions in Bangladesh have a profound impact on agriculture, specifically the crop-livestock integrated farming system in rural areas, as well as the economy and society at large. However, unethical practices and widespread poverty significantly hinder the country's development. Therefore, it is crucial to address these issues to foster sustainable growth, enhance resilience, and cultivate an equitable and inclusive society.

#### *For government bodies*

Addressing the multifaceted challenges within the agricultural sector requires concerted efforts from various stakeholders. In the context of government bodies, it is imperative to underscore the significance of fostering Public-Private Partnerships (PPPs) as a catalyst for innovation in small-scale milk and beef farming. Advocating for supportive policies facilitating collaboration between government entities and private stakeholders is crucial to propelling technological advancements. Additionally, there is a pressing need to revisit and update legislative measures, emphasizing perishable food items' safety and quality control. Policy revisions should align with sustainable production methods to bolster farm income and enhance national food security.

#### *For policymakers*

Policymakers are urged to consider strategies for poverty reduction and increased employment by supporting small-scale milk and beef farms. Recommendations should address policy barriers, climate conditions, and corruption risks. Furthermore, ethical

practices and governance should be at the forefront, with policies enforcing legal frameworks, raising awareness, and promoting ethical conduct to foster a just and equitable society.

#### *For social enterprises*

Social enterprises are encouraged to embrace social entrepreneurship as a driver for holistic development, contributing to economic diversification at individual, community, and regional levels. Active engagement in overcoming challenges, including policy barriers, climate conditions, and corruption risks, is paramount. Additionally, social enterprises should champion sustainable production methods and actively participate in the export market. Leveraging legislative revisions is vital to ensuring the safety and quality control of perishable food items, fostering continuous income streams for farmers. This comprehensive approach underscores the interconnectedness of public-private collaboration, policy adjustments, and social entrepreneurship in addressing the complex issues within the agricultural landscape.

In conclusion, the diverse geo-climate conditions in Bangladesh have a profound impact on agriculture, specifically the crop-livestock integrated farming system in rural areas, as well as the economy and society at large. However, unethical practices and widespread poverty significantly hinder the country's development. Therefore, it is crucial to address these issues to foster sustainable growth, enhance resilience, and cultivate an equitable and inclusive society.

## **7.2 Limitations to the direction for future research**

### *7.2.1 Limitations*

The study was conducted in three districts in Bangladesh, but it was not free from biases or limitations. For instance, there was limited scope to gather information on milk and beef production. On the other hand, the data related to various food production challenges in small-scale farming (such as milk and beef production) was linked to adverse weather events in the previous five years, COVID-19 outbreaks, and government restrictions. The secondary dataset and reports collected from government officials, NGOs, and private organizations in the three districts provided rich data but may not necessarily reflect all the regions in the country. In future studies, analyzing individual indicators and different factors may reveal different effects on food production in different regions and locations.

There were limitations with international databases such as the Corruption Perception Index and Global Climate Risk Index. Several indicators from different countries needed to be included in the data, but many countries still need to register or upload information on climate and corruption issues as projected by the index due to the missing database. During the cross-sectional analysis for data validity, reliability, and credibility, multiple sources showed different regions of the research site that lacked standard data, such as multidimensional poverty indicators. The poverty index showed variation in geographical locations, household production, and income related to food security. Hence, future research may consider studying individual indicators.

The primary data collected for this study relied on in-depth interviews, detailed explanations, graphs, and reports. The reliability and trustworthiness of the data depended on the honesty and truthfulness of the participants who provided the information. While the reports, records, text, and graphics used in the study were sourced from reliable sources, confirmation by participants was challenging. Some participants, including government officials and NGO representatives, were often reluctant to openly talk about controversial issues. Additionally, only farmers (farm-based social entrepreneurs) showed interest in explaining the level of corruption and bribery as cultural practices that took place unofficially. Thus, the findings of this study can be limited due to some participants' need for more participation and transparency.

This study on rare occasions faced some technical limitations, including data and network interruptions due to VoIP (voice over Internet Protocol) call services in specific geographical locations. Electronic devices can also be problematic. In one interview, the software did not respond to the applied command, which resulted in the inability to hear the participant's voice. A more responsive sound system may have prevented the interview from taking longer than expected and the participant from becoming impatient. In-depth interviews were time-consuming, and some participants sometimes needed to be more energized, which was a noted limitation.

Additional research work was necessary to address specific limitations encountered during data collection. While a suitable timeframe was identified to collect data, it was only sometimes convenient for participants to attend interview sessions due to various factors, such as government restrictions in response to the COVID-19 pandemic. In some instances,

participants were affected by the virus, and they were unable to attend the interview due to the isolation period. These circumstances imposed a time constraint on the study.

Self-reported data has limitations, as data accuracy depends on the type of data collection method used which may not be readily verified. Therefore, self-reported data can be partially biased. For example, it is challenging to recall past events accurately.

### *7.2.2 Directions of future research*

Food security has garnered significant attention across various research domains. While diverse aspects related to food production, safety, and security have been explored, there remains a need to develop comprehensive strategies, techniques, and policies to ensure food security. Future research should delve into various dimensions of food security, identifying gaps in the existing literature and offering avenues for further exploration. This includes refining food security indicators, identifying assessment techniques, and identifying risk factors for sustainable food production, income, safety, and security.

Adopting sustainable food production practices is crucial to farm-based social entrepreneurs in rural areas and vulnerable populations in coastal regions. Achieving sustainable food production, income, and security necessitates collaborative efforts, cooperation, and responsible policies from various stakeholders, including individual practitioners, researchers, institutions, and non-governmental organizations. The interconnections between food security, sustainable production, and income are pivotal, and future research should provide context-specific solutions at the individual, community, and national levels. Considerations for cultural food consumption habits, traditional production practices, the role of food producers, and societal and political acceptances should be integrated into future research.

In Bangladesh, agripartnerships are instrumental in rural economic development, particularly within agriculture and its sub-sectors, influenced by global economic trends. Integrating agricultural sub-sectors is imperative for social and economic development. Further research should focus on collective actions among stakeholders about food production, distribution, food safety, and security to address food insecurity challenges in Bangladesh.



Expanding research into the agripreneurial ecosystem, which supports farm-based social entrepreneurship in diverse food products, small-scale farming, and perishable food processing, presents rich opportunities for investigation. Cultural practices, individual and collective actions, and external influences that shape demographic, climatic, and economic trends should be considered to achieve food security objectives. Future studies can delve into societal choices concerning food production and consumption across various levels, emphasizing reframing programs or agendas to align with sustainable development goals.

In exploring future research avenues, empirical testing may involve surveys, interviews, or case studies with relevant agricultural sector stakeholders to validate the conceptual framework's relationships and propositions. Longitudinal studies offer insights into the sustainability of farm-based social entrepreneurship, capturing the evolution of these enterprises and their impact on sustainable food production and income over time.

Comparative analyses across regions or countries with varying levels of support for farm-based social entrepreneurship can help identify factors contributing to success or challenges, thereby informing policy recommendations for enhancing the entrepreneurial ecosystem. Assessing the impact of existing policies or interventions on the conceptual framework becomes crucial for policymakers to understand effective strategies for supporting sustainable food production, income, and food security.

Quantitative analysis, involving statistical methods, can quantify proposed relationships in the framework, measuring the impact of farm-based social entrepreneurship on critical indicators such as income levels and food security metrics. Validation workshops involving experts and stakeholders can refine the conceptual framework based on practical insights, ensuring its accuracy in reflecting real-world dynamics and fostering practical applications.

Research exploring unintended consequences or externalities of farm-based social entrepreneurship is essential to understand its effects on the broader ecosystem comprehensively. In summary, combining qualitative and quantitative methods could form the basis for future research, allowing for the testing and refining of the conceptual framework and providing practical insights for policy development.

### **7.3 Chapter summary**

This chapter concluded the study's investigation into food security in Bangladesh. The country ranks low in food security, with almost half its population facing food insecurity. The theoretical contribution of the study lies in exploring food security through social entrepreneurship within the agripreneurial ecosystem. It presents a model illustrating how sustainable production impacts food security and how farm-based social entrepreneurs play a vital role in enhancing household welfare. The study also addresses barriers to social entrepreneurship in milk and beef production, such as policy and legislative barriers, corruption risks, and climatic conditions. To achieve food security and enhance sustainable income, small-scale farmers require access to finance, business support, favorable policies, a supportive culture, human capital, and markets. The study also explores how the agripreneurial ecosystem can be linked to sustainable production and income, emphasizing the role of climate conditions and risk factors in promoting food security through small-scale milk and beef farms in rural areas.

The chapter has spelled out the study's main theoretical, practical, and methodological contributions. The practical and managerial contributions of the study aim to support policies and initiatives promoting small-scale milk and beef farms for food security. Finally, the chapter concludes by acknowledging the study's limitations and suggesting areas for further research. These include exploring various dimensions of food security, sustainable production, and income diversification for farm-based social entrepreneurship. The study emphasizes the importance of localized solutions and collaborative efforts to achieve food security goals for developing countries like Bangladesh.

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## Appendices

### Appendix 1.1

Table 4.15D The dataset is labeled as D-15 (Master Dataset)

Case No	Code of Govt. Office, NGO, and Private Org.	Forecast of Sustainable Milk Production (Metric Tons)-2019-2020	Forecast of Sustainable Beef Production (Metric Tons)-2019-2020	Actual Milk Production (Metric Tons) 2019-2020	Actual Beef Production (Metric Tons) 2019-2020	Total Milk Production (Metric Tons) in % in 2019-2020	Annual shortage/surplus of Milk Production in % in 2019-2020	Total Beef Production (Metric Tons) in % in 2019-2020	Annual shortage/surplus of Beef Production in % in 2019-2020
DLO-1	DLO-1, Gob	31130	15,558	20758	18810	66.68165757	<b>-33.31834243</b>	120.9024296	<b>20.90242962</b>
DLO-2	DLO-2, Shib	12187.5	9208.33	13937.5	9845.83	114.3589744	<b>14.35897436</b>	106.9230794	<b>6.923079429</b>
DLO-3	DLO-3, Bor	8922.5	11286.95	9222.84	10502.4	103.3660969	<b>3.366096946</b>	93.04905222	<b>-6.950947776</b>
YC-1	YC	10515.12	5722.09	10780.12	5580.53	102.5201805	<b>2.520180464</b>	97.52607876	<b>-2.473921242</b>
TMSS-1	TMSS	4166.66	1276.04	4320.12	1250.5	103.6830459	<b>3.683045893</b>	97.99849534	<b>-2.001504655</b>
TMSS-2	TMSS	4320.02	1339.09	4080.01	1520.2	94.44423868	<b>-5.555761316</b>	113.5248564	<b>13.52485643</b>
GB-1	GB	4280.07	1480.5	4467.15	1580.78	104.3709565	<b>4.37095655</b>	106.7733874	<b>6.773387369</b>

## Appendix 1.2

The third dataset

Table 2.21C Govt. Office/NGO/Private Org. Published Report-2019-2020 (Comparison between Milk and Beef Production)

Case No	DLO-1	DLO-2	DLO-3	YC-1	TMSS-1	TMSS-2	GB-1
Code	DLO-1, Gob	DLO-2, Shib	DLO-3, Bur	YC	TMSS	TMSS	GB
Forecast of Sustainable Milk Production (Metric Tons)-2019-2020	31130	12187.5	8965.95	10515.12	4166.66	4320.02	4280.07
Forecast of Sustainable Beef Production (Metric Tons)-2019-2020	15,558	9208.33	11286.95	5722.09	1276.04	1339.09	1480.5
Actual Milk Production (Metric Tons) 2019-2020	20758	13937.5	9222.84	10780.12	4320.12	4080.01	4467.15
Actual Beef Production (Metric Tons) 2019-2020	18810	9845.83	10502.4	5580.53	1250.5	1520.2	1580.78
Total Milk Production (Metric Tons) in % in 2019-2020	66.68165757	114.3589744	102.8651732	102.5201805	103.6830459	94.44423868	104.3709565
Annual shortage/surplus of Milk Production in % in 2019-2020	<b>-33.31834243</b>	<b>14.35897436</b>	<b>2.865173239</b>	<b>2.520180464</b>	<b>3.683045893</b>	<b>-5.55576132</b>	<b>4.37095655</b>
Total Beef Production (Metric Tons) in % in 2019-2020	120.9024296	106.9230794	93.04905222	97.52607876	97.99849534	113.5248564	106.7733874
Annual shortage/surplus of Beef Production in % in 2019-2020	<b>20.90242962</b>	<b>6.923079429</b>	<b>-6.95094778</b>	<b>-2.473921242</b>	<b>-2.00150466</b>	<b>13.52485643</b>	<b>6.77338737</b>

Table 2.21D Transcript (GOVT. NGOs and Private Organizations)

The research focuses on measuring sustainable milk and beef production among farmers annually on the research site. The analysis involves examining interview transcripts from various stakeholders, including Government offices, NGOs, and private organizations, along with their published records. The enclosed table presents the interview transcripts for reference.

1st order quote	Interpretation	Theme	Theoretical Aspect	Interview No	Category
-----------------	----------------	-------	--------------------	--------------	----------

"Our production target area was low earlier. Lately, we have been working on production targets. For example, we built the Livestock Smart Village. We keep a special watch and ensure regular immunization, deworming, and still granular food. I monitor if the fine foods are being fed properly. We check whether farmers are cultivating grass or not. If they do not cultivate grass, we encourage them to grow grass. We have dairy and poultry belts everywhere. We monitor them closely."	The participant has mentioned his production target, area, and facilities of farmers.	Increasing Farm Production	Supply and Demand	VS-1	Increasing Farm Production
"Agriculture has rice or vegetables inside, but we do not work with them. We only work on milk, eggs, and meat. That means we are working on food security parcels. We cannot do complete work. Here are limitations or limitations at our workplace. We advise the farmers to increase our milk, eggs, and meat production. Normal so that people can get milk, eggs, meat at a fair price."	The participant has a food security plan, and therefore, he has stated.	FS	FS		FS
"In this case, the first thing we suggest is whether it has any worm problems such as endoparasite and ectoparasite. If there is a sub-drain, milk may be less in that case. That is why endo and ectoparasite treatment. Then we ask about the food he is currently eating. For example, feeding cows, especially raw grass, increases milk production and maintains good health. That is why we offer advice on production and feeding. And the second thing is that we often ask them if they have protein, sugar, vitamins, and mineral salts in their fine food, and we give them diet advice. We say that you will see these things every day. Depending on the cow's weight, we may say that it may take more or less food. We recommend adequate watering. We recommend feeding calcium as well. If calcium is added to the granular diet, the milk production of a cow increases by about 2 liters per day."	The participant has pointed out the core issues of increasing milk production.	SP	Milk Production		SP
"In my opinion, it is not right to go together in two. You cannot give time when you go together in two. You start with focusing on anyone. Cattle farms are a livestock business. The livestock business has more care or cares to take. If you start two first, you will see that you are more likely to be interrupted. My advice would be to work on anyone. You either have to go to dairy or go to livestock."	The participant has suggested starting with either dairy or cattle fattening. It will not be a wise decision to run both simultaneously.	SE	Dairy and Fattening	DLO-1	SE

“Agriculture has rice or vegetables inside, but we do not work with them. We only work on milk, eggs, and meat. That means we are working on food security parcels. We cannot do complete work. Here are limitations or limitations at our workplace. We advise the farmers to increase our milk, eggs, and meat production. Normal so that people can get milk, eggs, meat at a fair price.”	The participant has explained how to increase food security through milk, beef, and livestock production.	FS	Food Security		FS
“Milk costs much less than that. It is 40 katas a liter. The farmers are forced to sell milk at such a low price. The reason is the Crisis of Consumers. Lack of awareness among those who are composition.”	The participant has pointed out a crisis of consumers who will consume milk.	Less consumption of milk	Vitamin deficiency		Less consumption of milk
"The small ones are somewhat sustainable. The milk of small ones is less. They eat some themselves and sell some. Farmers who have 8 to 10 cows cannot sell the milk properly. For example, when there is a natural disaster or flood, it becomes a problem to sell their milk. In that case, he should have expanded, but he did not do it. When he says we cannot sell milk, we cannot take the risk of expanding the farm. He could have expanded the farm further if he had been assured that he would get the milk price. And especially now because of the corona, people's purchasing power has decreased."	The participant has pointed out that small dairy holders who have 1-2 dairy cows are sustainably compared with other dairy cow holders who have 5-10 dairy cows. Moreover, subsistence dairy cow holders (holding 1-2 dairy cows) are not affected by floods or natural disasters. Therefore, they do not have a problem selling their surplus milk after household consumption. On the other hand, commercial dairy holders face problems all the time.	SP	Food Security		SP
“Especially among small entrepreneurs who are running small farms. My responsibility is to provide liquid money support to entrepreneurs.”	The participant is helping with financial support to run entrepreneurship.	E/F (Finance)	Financial aid is one out of six dimensions of an ecosystem.	TMSS-1	E/F (Finance)
“This is especially our Daslal village. There are many families in this village with small farms. The number of cows on the farms will be 4 to 5 and 8 to 10 cows. Several farms, especially Naogaon and Provurampur, and the farmers are dependent on these farms.”	The participant has highlighted that they have designated areas with a particular focus on their activities to increase their food security sustainably.	FS	Food Security		FS
“Since I joined the branch, I have seen that people from Daslal, Bandighi, Chhagram, and Provurampur, the area is experienced in a beef fattening and milk production and are conducting operations. That is why these three zones have been taken as the main zones. Now there are other areas besides this. Here and how to grow entrepreneurs? How can they be brought under our branch? How can they be made strong? I am currently in such a process.”	The participant mentioned that he has a special zone where successful entrepreneurs run their farms to produce milk and beef production sustainably. The NGO has recognized these areas as the central milk and beef production zones.	SP	Sustainable Production		SP

“We work by choosing the poorest from the grassroots. They buy their cows or goats through loans. So, it is our loan process.”	The participant has pointed out a loan for cattle or goats so that loan borrowers can earn money quickly and pay the installment.	E/F (Finance)	Finance is one out of six dimensions of an ecosystem.	TMSS-2	E/F (Finance)
"Increasing crop production and dairy farm production has increased income and reduced costs. Farmers expect more products according to the management of their farms."	The participant has explained that farmers' income depends on the production of farmers. Therefore, there is a relationship between production, earning, and food security.	FS	Food Security		FS
“I have seen that the daily milk production of farmers is 15-16 liters per cow. I got the lowest milk production of 2-3 liters per cow per day.”	The participant has explained the highest production of milk and lowest production of milk that his farmers obtain.	SP	Sustainable Production		SP
“We had a mission-driven objective. We, therefore, selected dairy farmers to create the source of raw material for Grameen-Danone Yogurt. We started a dairy co-cooperative and gave them a certain loan to purchase a dairy cow.”	The participant explained that they had a mission-driven objective to solve the malnutrition problem through Grameen-Danone Yogurt. Therefore, they had to run a dairy co-operative through a microcredit program.	FS	Food Security	YC	FS
“Grameen-Danone is located in Bogra District. We, therefore, selected neighboring villages of this Food Factory. Due to the continued supply of raw milk, we focus on the poor and pro-poor. Therefore, the children can benefit from the vitamin deficiency problem. In the Bogra district, we sell Grameen-Danone Yogurt at an affordable price. Therefore, the Bogra District has been selected. We cover the vitamin deficiency issue in a rural village through Grameen-Danone Yogurt.”	The participants illustrated that they have created a raw milk supply chain. They have provided loans. Therefore, farmers have purchased dairy cows. They produce milk and sell milk to Grameen-Danone Foods Ltd. This company has an objective to eliminate vitamin deficiency in malnutrition children.	FS	Food Security (Active and Healthy Life)		FS
“We have a selected area in Bogra District. We have 500 milk and beef farmers. They sustain production and income diversifications due to constant income through milk production.”	The participants mentioned that they have selected the area. Therefore, loan borrowers operate and sustain their production due to income diversifications and cash flows.	Income Diversifications	Sustainable Income and Income Diversifications		Income Diversifications
“We have a mission to eliminate poverty. We, therefore, look at a hard worker who can utilize our loan and improve his household income. Many borrowers have failed to run a farm. They do not have working capital. Therefore, we select them and give them working capital and start-up funding. Some require loans for working capital, feed, shed, and veterinary items. We provide them with a loan and advise them to meet an officer or veterinary doctor at the livestock office.”	The participant has explained that they look for hard workers. They, therefore, give them a loan. They want to improve their lifestyle through income generation. They generate income through microbusinesses, dairy farms, or cattle fattening.	E/F (Finance)	Finance is one out of six dimensions of an ecosystem.	GB-1	E/F (Finance)

“I saw 7-8 liters per cow daily. They inseminated and managed crossbreeding variety. I saw an indigenous variety that gives 3-4 liters of milk per cow daily. I always advise them to have crossbreeding cows.”	The participant has explained that they have maintained a relationship with each borrower. They work together as a family member.	SP	Sustainable Production		SP
“We visit the center. We check to continue with our loan borrowers. We look at improving the socio-economic conditions of our borrowers.”	The participant has pointed out that he visits every center with 60 loan borrowers. They know the individual family story. They look at their financial and social, and economic conditions.	SDG’s goal	Sustainable Development Goals		SDG’s goal

**Appendix 1.3**  
The 1st tabulation sheet  
Table 4.21A

Case No	Code	Gender	Age at present	Establish Business (Entrepreneurship)	No of meals per day (before entrepreneurship)	Scale 1-5, balanced diet per day at present	Financial resources at initial stage	Capital Investment in TK (BD currency)	Government Support (Juba Unnayan, DLS and DLO)	Milk production at initial stage (liter per cow/day)	Milk production at present (liter per cow/day)	Daily milk production in total (liters)	No of dairy cows (milking stage)	No of dairy cows including heifers	No of cattle (for beef production)	Market linkage	Sales problem	Additional income sources	PI	Household Gross Income (2020)	Household Expenses (2020)	Net Income	Household Assets	Acres of land (purchase d/leased land)	Build a new house	No of cows shed	No of Bio-Gas Plant	The position of Socio Economic Development (Scale 1-5)	No of follow-up communications	Comments
1	FI R	Male	28	2016	2	2.5	NGO	35000	Training	7	9	18	2	6	2	Local	None	CBF	12000	15000	90000	60000	Yes	1.5	0	1	0	2	3	Leased land for grass
2	ANI	„	34	2010	2.5	2.8	Govt. bank	30000	„	5	20	60	3	9	2	„	Yes	„	24000	55000	25000	300000	„	2	1	1	0	3	2	Purchased cropland
3	SYD	„	31	2017	3	4	Family and Job	190000	„	7	15	90	6	10	4	„	None	CBF	120000	109500	365000	730000	„	0	1	1	1	3	4	Purchased cropland
4	MIS	„	28	2017	2	2.5	Job	200000	„	3	7	28	4	6	2	„	„	CBF	12000	16500	11500	50000	„	1.5	0	1	0	2	5	Leased land for grass
5	AKT	Female	32	2010	2	2.5	Family	60000	„	4	16	32	2	3	1	„	„	CBF	24000	23400	78000	156000	„	1		1	0	2	2	Leased land for grass
6	SHA	„	30	2012	2	2.5	Family and Job	50000	„	7	13	26	2	4	2	„	„	CBF	15000	10800	36000	72000	„	0	1	0	0	2	2	Purchased a new bike
7	SHR	Male	43	2012	2	2.8	Family and Job	154000	„	6	20	40	2	4	4	„	Yes	CBF	60000	45000	15000	300000	„	0	1	1	1	3	3	Using own land
8	ZIA	„	25	2015	2	2.5	NGO	50000	„	4	7	28	4	5	1	„	None	CBF	10000	12000	80000	40000	„	0	0	1	0	1	2	
9	KHA	Female	24	2018	3	2.8	Family and Job	66000	„	5	16	64	4	7	3	„	„	CBF	15000	48000	18000	300000	„	1.5	0	1	0	3	5	Leased land for grass
10	SAI	Male	40	2020	2	2.5	Family	250000	„	3	8	24	3	6	2	„	„	CBF	18000	15000	65000	85000	„	0	0	1	0	2	2	To repair house
11	JEW	„	41	2016	2	2.5	Family	200000	„	3	8	24	3	4	2	„	Yes	CBF	12000	15000	85000	65000	„	0	0	1	0	2	3	To repair house



12	AS A	„	36	2004	3	<b>2.8</b>	Entrepren eurship	16000 0	„	13	20	60	3	4	2	„	Non e	CBF	750 00	50000 0	20000 0	<b>300 000</b>	„	1.5	0	1	0	3	3	Renov ating old house
13	BE L	„	57	2013	1	<b>3.5</b>	Self- employed	82000	„	4	18	108	6	10	4	„	Yes	CBF	0	75000 0	25000 0	<b>500 000</b>	„	1.5	1	1	0	3	3	Purch ased cropla nd
14	SE K	„	60	2010	2	<b>2.8</b>	Family	54000	„	8	16	48	3	4	2	„	Non e	CBF	150 00	45000 0	15000 0	<b>300 000</b>	„	1.5	0	1	0	2	2	Lease d land for grass
15	M AL	„	45	2010	2	<b>2.6</b>	Self- employed	50000	„	7	16	48	3	4	2	„	„	CBF	960 00	35000 0	15000 0	<b>200 000</b>	„	1.5	1	0	0	2	2	Lease d land for grass
16	SA L	„	44	2010	2	<b>2.5</b>	Family	15000 0	„	7	12	36	3	3	3	„	„	CBF	100 00	25000 0	10000 0	<b>150 000</b>	„	0.25	1	1	0	2	2	Purch ased reside ntial land
17	D AS	„	33	2010	2	<b>3</b>	Family and NGO	66000	„	4	12	24	2	2	2	„	„	CBF	800 0	60000 0	25000 0	<b>350 000</b>	„	2	1	1	0	3	4	Lease d land for grass
18	MI N	„	33	2010	2	<b>3</b>	Family and NGO	66000	„	4	12	24	2	2	2	„	„	CBF	800 0	60000 0	25000 0	<b>350 000</b>	„	2	1	1	0	3	4	Lease d land for grass
19	U M F	„	38	2006	3	<b>2.5</b>	Family	85000	„	3	8	16	2	2	2	„	Non e	CBF	840 00	24000 0	14400 0	<b>960 00</b>	„	2	1	1	0	3	4	Purch ased cropla nd

Note

**N.B.**

**CBF:** Crop, business (vet supplier), fish farming and home gardening; it has been used in column 19 and the 2nd row.

**P.I.:** Previous income (before small-scale dairy and beef farming) has been used in column 20 in the 1st row.

I have created a tabulation sheet to analyze service facilities (vet supply, artificial insemination, and medicine), financial support, training support, and counseling support for milk and beef farmers. Therefore, I can look at how they have achieved sustainable milk and beef production or not on the research site. I, thus, have enclosed below:

## Appendix 1.4

**Table 4.22A The 2<sup>nd</sup> tabulation sheet**

The government office, NOGs, and private organizations

Case No	Code (Govt. Office)	NGO/Private Org.	Financial Support (Access to credit)	Amount of credit access at initial stage in TK	Other assistance offered (LSP, AI, Vaccines), scale 1 to 5	Provide Certificates (Loan Recommendation)	Loan Access or links (Availability for farmers)	Govt. Training support on small-scale dairy/beef farming-2019-20	Livestock services (Vet and Medications-2015-16)	Livestock services (Vet and Medications-2016-17)	Livestock services (Vet and Medications-2017-18)	Livestock services (Vet and Medications-2018-19)	Livestock services (Vet and Medications-2019-20)	Livestock services	Market linkage	Govt. Assistance for Milk Farmers, 1-2 dairy cows-2019-2020	Govt. Assistance for Milk Farmers, 5-10 dairy cows-2019-2020	Govt. Assistance for Beef Farmers, 1-2 dairy cows-2019-2020	Govt. Assistance for Beef Farmers, 5-10 dairy cows-2019-2020	No of follow-up communications	Comments
1	DIO-1, Gob		None	0	3	Govt. Bank and Juba Unnayan	Govt. Bank, SME Foundation and Juba Unnayan	1st phase 8-10, 2nd phase 30-35, and 3rd phase 70-75	12000	9550	10500	11580	11970	Vet and medications	None	5985	5386	6583	1795	4	
2	VS-1, Gob		„	0	3	„	„	„	12000	11500	10500	12000	11500	Vaccines	None	5750	6325	5175	1725	4	
3	DLO-2, Shib		„	0	3	„	„	„	10500	90500	12000	11500	12500	Vaccines	None	5625	6875	4375	1875	3	
4	VS-2, Shib		„	0	3	„	„	„	10500	10000	12500	13200	12125	Vaccines	None	4243	3031	2425	1818	3	
5	DLO-3, Bor		„	0	3	„	„	„	9500	10500	10000	9000	8500	„	None	3825	2975	2125	1275	5	
6	VS-3, Bor		„	0	3	„	„	„	8500	9000	8000	7500	8000	„	None	3600	2800	2000	1200	5	
7	YC	Yunus Centre, Dhaka	Yes	40000	3	None	Seed funding/start-up loan and working capital	GB-Training	2230	2340	2430	2640	3440	Vaccines	With Grameen-Danone Foods Limited	2236	1720	1204	516	5	
7	„	„			3	„	„	Grameen-Danone Livestock Services	1115	1170	1215	1320	1720	Artificial insemination (AI)		946	774	602	258	4	
8	TMSS-1	TMSS, MGO	„	100000	3	„	„	TMSS-Training	1820	2200	2270	2310	2515	Vaccines	With local buyers	1634	1383	880	377	6	
9	„	„			3	„	„	TMSS Livestock Services	1800	2200	2500	2700	2810	Artificial insemination (AI)	„	1826	1545	983	421	5	
10	TMSS-2	TMSS, MGO	„	50000	3	„	„	TMSS Training	3210	2715	2500	2780	3210	Vaccines	With BRAC (NGO)	2728	1444	1123	481	5	
11	,	„	„		3	„	„	TMSS Livestock Services	2210	2300	1930	1870	2470	Artificial insemination (AI)	„	1605	864	617	370	5	
12	GB-1	Grameen Bank	„	40000	2	„	„	Counselling Service on Food Security,	2310	1790	1580	1860	2250	Vaccines	Within GB Members	1462	1012	787	337	4	

								675 members													
13	„	„	„		2	„	„	„	1180	1270	1510	1911	2570	Artificial inseminati on (AI)	„	1670	1156	899	385	4	

**Note:**

GB-Training: Grameen-Danone Training Scheme (production Management) 50 members

TMSS-Training (TMSS-1): TMSS Training Scheme (production Management) 100 members

TMSS-Training (TMSS-2): TMSS Training Scheme (production Management) 75 members

**Appendix 1.5**

Table 4.22B The 3rd tabulation sheet  
(Govt. Office/NGO/Private Org.)

Case No	Code (Govt. Office)	NGO/Private Org.	Financial Support (Credit Access)	Other assistance offered (Training, AI Semi nation & Vaccination)			Certificate, loan/access availability for farmers		Govt. Support (Training) on Entrepreneurship/Small-scale dairy & beef farming (2019-20)	Livestock services (Vet & Medication)- 2015-16	Livestock services (Vet & Medication)- 2016-17	Livestock services (Vet & Medication)- 2017-18	Livestock services (Vet & Medication)- 2018-19	Livestock services (Vet & Medication)- 2019-20	Market Linkages	Milk and Beef Farmers (Govt. assistance 2019-20)		Milk and Beef Farmers (Govt. assistance 2019-20)		Comments
1	DLO-1, Gob		None			3	Govt. Bank	Juba Unnayan	Annually training facilities by Department of livestock office (DLO)	Vet services = 12,000	Vet services = 9,550	Vet services = 10,500	Vet services = 11,580	Vet services = 11,970	None	Milk (1-2 cows)	Beef (1-2 cattle)	Milk (5-10 cows)	Beef (5-10 cattle)	
									1 <sup>st</sup> phase											
									2 <sup>nd</sup> phase											
									3 <sup>rd</sup> phase											
2	VS-1, Gob		None			3	Govt. Bank	Juba Unnayan	Livestock services- 2019/2020	AI =	AI =	AI =	AI =	AI =	None	5,500	6,400	500	200	Milk farmers- 60%, Beef farmers- 40%, Supply of vaccine- 12,000, and demand of vaccine- 120,000
									10-12,000 milk & beef farmers 5,000 subsistence farmers	Vaccine = 12,000	Vaccine = 11,500	Vaccine = 10,500	Vaccine = 12,000	Vaccine = 11,500						
3	DLO-2, Shib		None			3	Govt. Bank	Juba Unnayan	Annually training facilities by Department of livestock office (DLO)							Milk (1-2 cows)	Beef (1-2 cattle)	Milk (5-10 cows)	Beef (5-10 cattle)	
									1 <sup>st</sup> phase											
									2 <sup>nd</sup> phase											

									3 <sup>rd</sup> phase	75 Farmers										
4	VS-2, Shib		None			3	Govt. Bank	Juba Unnayan	Livestock services-2019/2020		AI =	AI =	AI =	AI =	AI =	None				
									10-12,000 milk & beef farmers 5,000 subsistence farmers		Vaccine =	Vaccine =	Vaccine =	Vaccine =	Vaccine =					
5	DLO-3, Bor		None			3	Govt. Bank	Juba Unnayan	Annually training facilities by Department of livestock office (DLO)							None	Milk (1-2 cows)	Beef (1-2 cattle)	Milk (5-10 cows)	Beef (5-10 cattle)
									1 <sup>st</sup> phase	8-10 Farmers									49	177
									2 <sup>nd</sup> phase	30-35 Farmers										
									3 <sup>rd</sup> phase	75 Farmers										
6	VS-3, Bor		None			3	Govt. Bank	Juba Unnayan	Livestock services-2019/2020		AI =	AI =	AI =	AI =	AI =	None				
									10-12,000 milk & beef farmers 5,000 subsistence farmers 94,340 cattle		Vaccine =	Vaccine =	Vaccine =	Vaccine =	Vaccine =					
7	YC	YC (Yunus Centre), Dhaka	Tk 40,000-Tk 200,000			3	Seed Funding/Start-up Loan	Working Capital Access	Grameen-Danone Training Scheme (Production Management)		AI = 1,115	AI = 1,170	AI = 1,215	AI = 1,320	AI = 1,720	With Grameen-Danone Foods Ltd.	1219	789	520	380
											Vaccine = 2,230	Vaccine = 2,340	Vaccine = 2,430	Vaccine = 2,640	Vaccine = 3,440					
8	TMSS-1	TMSS, NGO	Tk 1,00,000-Tk 6,00,000			3	TMSS Agriculture Loan	TMSS Credit Access	TMSS Training Scheme (Production Management)		AI = 1,800	AI = 2,200	AI = 2,500	AI = 2,700	AI = 2,810	With Local Buyers	2,800	2,300	36	48
											Vaccine = 1,820	Vaccine = 2,200	Vaccine = 2,270	Vaccine = 2,310	Vaccine = 2,515					
9	TMSS-2	TMSS, NGO	Tk 50,000-Tk 1,00,000			3	TMSS Agriculture Loan	TMSS Credit Access	TMSS Training Scheme (Production Management)		AI = 2,210	AI = 2,300	AI = 1,930	AI = 1,870	AI = 2,470	With BRAC (NGO)	3,300	2,700	40	32
											Vaccine = 3,210	Vaccine = 2,715	Vaccine = 2,500	Vaccine = 2,780	Vaccine = 3,210					
10	GB-1	GB (Grameen Bank)-1	Tk 40,000-Tk 3,00,000	1			Grameen Loan	Multi Credit Access	Counselling Services (Food Security)		AI = 1,180	AI = 1,270	AI = 1,510	AI = 1,911	AI = 2,570	Within GB members	3,230	2,210	42	38
											Vaccine = 2,310	Vaccine = 17,90	Vaccine = 1,580	Vaccine = 1,860	Vaccine = 2,250					

Third tabulation sheet (Contd.), 2015-2016 to 2019-2020  
Govt. Office/NGO/Private Org.

Case/Code No	Govt. Office	NGO/Private Org.	Sustainable production target on selected area- 2019-20		Annual milk/beef production obtained in Upazila-2019-20		Annual shortage of milk and beef production/surplus- 2019-20	
	Department of Livestock Office (DLO)		Milk	Beef	Milk	Beef	Milk	Beef
DLO-1	DLO-1, Gob							
DLO-2	DLO-2, Shib							
DLO-3	DLO-3, Bor	----- -----	8,965.95 MT	11,286.95 MT	8,836.68 MT	10,266.40 MT	98.55%	90.95%
YC-1		YC	10,519.12 MT	5,722.09 MT	9,623.78 MT	5,580.53 MT	91.48%	97.52%
TMSS-1		TMSS	4,166.66 MT	1,276.04 MT	3,980.97 MT	1,163.75 MT	95.54%	91.20%
TMSS-2		TMSS	4,320.02 MT	1,339.09 MT	4,080.01 MT	1,171.93 MT	94.44%	87.61%
GB-1		GB	4,280.07 MT	1,480.50 MT	4,190.76 MT	1,378.87 MT	97.91%	93.13%

Govt. Office/NGO/Private Org.

Case/Code No	Govt. Office	NGO/Private Org.	Sustainable production target on selected area- 2018-19		Annual milk/beef production obtained in Upazila-2018-19		Annual shortage of milk production/surplus- 2018-19	
	Department of Livestock Office (DLO)		Milk	Beef	Milk	Beef	Milk	Beef
DLO-1	DLO-Gob							
DLO-2	DLO-Shib							
DLO-3	DLO-Bor		8,896.45 MT	12,005.21 MT	9,096.06 MT	11,783.17 MT	102.24%	98.15%
YC-1		YC	10,212.50 MT	5,560.22 MT	9,780.50 MT	5,320.03 MT	95.76%	95.68%
TMSS-1		TMSS	4,220.77 MT	1,186.54 MT	3,790.57 MT	1,120.66 MT	89.80%	94.44%
TMSS-2		TMSS	4,180.14 MT	1,058.89 MT	3,680.77 MT	1,033.69 MT	88.05%	97.62%
GB-1		GB	4,170.05 MT	1,450.50 MT	4,060.88 MT	1,289.90 MT	97.38%	88.92%

Govt. Office/NGO/Private Org.

Case/Code No	Govt. Office	NGO/Private Org.	Sustainable production target on selected area- 2017-18	Annual milk/beef production obtained in Upazila-2017-18	Annual shortage of milk production/surplus- 2017-18
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	Department of Livestock Office (DLO)		Milk	Beef	Milk	Beef	Milk	Beef
DLO-1	DLO-Gob							
DLO-2	DLO-Shib							
DLO-3	DLO-Bor							
YC-1		YC	8,760.22 MT	4,320.20 MT	7,980.44 MT	3,860.70 MT	91.09%	89.36%
TMSS-1		TMSS	3,720.22 MT	1,020.30 MT	3,544.90 MT	980.30 MT	95.28%	96.07%
TMSS-2		TMSS	3,570.80 MT	1,120.78 MT	3,459.70 MT	1,098.60 MT	96.88%	98.02%
GB-1		GB	3,670.90 MT	1,320.60 MT	3,578.90 MT	1,280.80 MT	97.49%	96.98%

Govt. Office/NGO/Private Org.

Case/Code No	Govt. Office	NGO/Private Org.	Sustainable production target on selected area- 2016-17		Annual milk/beef production obtained in Upazila-2016-17		Annual shortage of milk production/surplus- 2016-17	
	Department of Livestock Office (DLO)		Milk	Beef	Milk	Beef	Milk	Beef
DLO-1	DLO-Gob							
DLO-2	DLO-Shib							
DLO-3	DLO-Bor							
YC-1		YC	7,560.20 MT	3,280.90 MT	7,200.20 MT	2,820.90 MT	95.23%	85.97%
TMSS-1		TMSS	3,280.30 MT	980.11 MT	3,020.40 MT	850.31 MT	92.07%	86.75%
TMSS-2		TMSS	3,160.80 MT	1,070.20 MT	2,832.40 MT	791.78 MT	89.61%	73.98%
GB-1		GB	3,212.90 MT	1,280.79 MT	2,780.89 MT	1,090.50 MT	86.55%	85.14%

Govt. Office/NGO/Private Org.

Case/Code No	Govt. Office	NGO/Private Org.	Sustainable production target on selected area- 2015-16		Annual milk/beef production obtained in Upazila-2015-16		Annual shortage of milk production/surplus- 2015-16	
	Department of Livestock Office (DLO)		Milk	Beef	Milk	Beef	Milk	Beef
DLO-1	DLO-Gob							
DLO-2	DLO-Shib							
DLO-3	DLO-Bor							
YC-1		YC	5,520.20 MT	2,780.50 MT	4,480.90 MT	2,360.79 MT	81.35%	84.90%

TMSS-1		TMSS	2,828.50 MT	820.50 MT	2,380.20 MT	699.20 MT	84.14%	85.21%
TMSS-2		TMSS	2,991.30 MT	1,000 MT	2,478.90 MT	880.30 MT	82.87%	88.03%
GB-1		GB	2,970.30 MT	1,230.10 MT	2,420.30 MT	975.30 MT	81.48%	79.28%

## Appendix 1.6

Table 6.1 The National Household Survey Data, 2016

S/N	Major Food Intake	Area	Gram / K. Cal/day	National Level
1	Staple Food		975.53gm/day	
2	Major Food Intake	Rural	2240.2 K. Cal	2210.4K. Cal
3	„	Urban	2130.7 K. Cal	
4	Protein Intake	Rural	63.30 K. Cal	63.80 K. Cal
5	„	Urban	65.00 K. Cal	

*NHS, 2016*

## Appendix 1.7

Table 4.23A 1<sup>st</sup> dataset (Govt. NOGs and private organizations) 2019-2020

Case No	Code of Govt. Office, NGO, and Private Org.	Forecast of Sustainable Milk Production (Metric Tons)-2019-2020	Forecast of Sustainable Beef Production (Metric Tons)-2019-2020	Actual Milk Production (Metric Tons) 2019-2020	Actual Beef Production (Metric Tons) 2019-2020	Total Milk Production (Metric Tons) in % in 2019-2020	Annual shortage/surplus of Milk Production in % in 2019-2020	Total Beef Production (Metric Tons) in % in 2019-2020	Annual shortage/surplus of Beef Production in % in 2019-2020
DLO-1	DLO-1, Gob	31130	15,558	20758	18810	66.68165757	<b>-33.31834243</b>	120.9024296	<b>20.90242962</b>
DLO-2	DLO-2, Shib	12187.5	9208.33	13937.5	9845.83	114.3589744	<b>14.35897436</b>	106.9230794	<b>6.923079429</b>
DLO-3	DLO-3, Bur	8922.5	11286.95	9222.84	10502.4	103.3660969	<b>3.366096946</b>	93.04905222	<b>-6.950947776</b>
YC-1	YC	10515.12	5722.09	10780.12	5580.53	102.5201805	<b>2.520180464</b>	97.52607876	<b>-2.473921242</b>
TMSS-1	TMSS	4166.66	1276.04	4320.12	1250.5	103.6830459	<b>3.683045893</b>	97.99849534	<b>-2.001504655</b>
TMSS-2	TMSS	4320.02	1339.09	4080.01	1520.2	94.44423868	<b>-5.555761316</b>	113.5248564	<b>13.52485643</b>
GB-1	GB	4280.07	1480.5	4467.15	1580.78	104.3709565	<b>4.37095655</b>	106.7733874	<b>6.773387369</b>

Table 4.24A 1<sup>st</sup> dataset (Govt. NOGs and private organizations) 2018-2019



Case No	Code of Govt. Office, NGO, and Private Org.	Forecast of Sustainable Milk Production (Metric Tons)-2018-2019	Forecast of Sustainable Beef Production (Metric Tons)-2018-2019	Actual Milk Production (Metric Tons) 2018-2019	Actual Beef Production (Metric Tons) 2018-2019	Total Milk Production (Metric Tons) in % in 2018-2019	Annual shortage/surplus of milk production in % in 2018-2019	Total Beef Production (Metric Tons) in % in 2018-2019	Annual shortage/surplus of beef production in % in 2018-2019
DLO-1	DLO-1, Gob	25838	12913	19875.7	14890	76.92429755	<b>-23.07570245</b>	115.3101526	<b>15.31015256</b>
DLO-2	DLO-2, Shib	11250	7812.5	11875	8210.75	105.55555556	<b>5.555555556</b>	105.0976	<b>5.0976</b>
DLO-3	DLO-3, Bur	8896.45	12005.21	9096.06	11598.17	102.2437039	<b>2.243703949</b>	96.60947205	<b>-3.390527946</b>
YC-1	YC	10212.5	5560.22	10500.33	5320.03	102.8184088	<b>2.818408813</b>	95.6802069	<b>-4.319793102</b>
TMSS-1	TMSS	4220.77	1186.54	4280.15	1217.87	101.4068523	<b>1.406852304</b>	102.6404504	<b>2.640450385</b>
TMSS-2	TMSS	4180.14	1058.89	3872.88	1160.78	92.64952848	<b>-7.350471515</b>	109.6223404	<b>9.622340375</b>
GB-1	GB	4170.05	1450.5	4290.23	1498.7	102.8819798	<b>2.881979832</b>	103.3229921	<b>3.322992072</b>

Table 4.25A 1st dataset (Govt. NOGs and private organizations) 2017-2018

Case No	Code of Govt. Office, NGO, and Private Org.	Forecast of Sustainable Milk Production (Metric Tons)-2017-2018	Forecast of Sustainable Beef Production (Metric Tons)-2017-2018	Actual Milk Production (Metric Tons) 2017-2018	Actual Beef Production (Metric Tons) 2017-2018	Total Milk Production (Metric Tons) in % in 2017-2018	Annual shortage/surplus of milk production in % in 2017-2018	Total Beef Production (Metric Tons) in % in 2017-2018	Annual shortage/surplus of beef production in % in 2017-2018
DLO-1	DLO-1, Gob	19378	9685	16510	10900	85.19971101	<b>-14.80028899</b>	112.5451729	<b>12.54517295</b>
DLO-2	DLO-2, Shib	12000	9000	12562	9187	104.6833333	<b>4.683333333</b>	102.0777778	<b>2.077777778</b>
DLO-3	DLO-3, Bur	8300	7400	8420	6916	101.4457831	<b>1.445783133</b>	93.45945946	<b>-6.540540541</b>
YC-1	YC	8760.22	4320.2	8950	4070.7	102.1663839	<b>2.166383949</b>	94.22480441	<b>-5.775195593</b>
TMSS-1	TMSS	3720.22	1020.3	3844.9	1070.7	103.3514147	<b>3.351414701</b>	104.9397236	<b>4.939723611</b>
TMSS-2	TMSS	3570.8	1120.78	3459.7	1198.6	96.8886524	<b>-3.111347597</b>	106.9433787	<b>6.943378718</b>

GB-1	GB	3670.9	1320.6	3731.9	1350.72	101.6617178	<b>1.661717835</b>	102.2807815	<b>2.280781463</b>
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Table 4.26A 1<sup>st</sup> dataset (Govt. NOGs and private organizations) 2016-2017

Case No	Code of Govt. Office, NGO, and Private Org.	Forecast of Sustainable Milk Production (Metric Tons)-2016-2017	Forecast of Sustainable Beef Production (Metric Tons)-2016-2017	Actual Milk Production (Metric Tons) 2016-2017	Actual Beef Production (Metric Tons) 2016-2017	Total Milk Production (Metric Tons) in % in 2016-2017	Annual shortage/surplus of milk production in % in 2016-2017	Total Beef Production (Metric Tons) in % in 2016-2017	Annual shortage/surplus of beef production in % in 2016-2017
DLO-1	DLO-1, Gob	17053	9200	15370	9990	90.13076878	<b>-9.86923122</b>	108.5869565	<b>8.586956522</b>
DLO-2	DLO-2, Shib	10875	8625	11512	8887	105.8574713	<b>5.857471264</b>	103.0376812	<b>3.037681159</b>
DLO-3	DLO-3, Bur	7470	6225	7262	5879	97.21552878	<b>-2.784471218</b>	94.44176707	<b>-5.558232932</b>
YC-1	YC	7560.2	3280.9	7699.2	3180	101.8385757	<b>1.838575699</b>	96.92462434	<b>-3.075375659</b>
TMSS-1	TMSS	3280.3	890.11	3370.4	920.31	102.7467	<b>2.746699997</b>	103.3928391	<b>3.392839087</b>
TMSS-2	TMSS	3260.8	1070.2	3332.4	1120.78	102.1957802	<b>2.195780177</b>	104.7262194	<b>4.726219398</b>
GB-1	GB	3212.9	1280.79	3120.89	1299.5	97.13623206	<b>-2.863767936</b>	101.4608172	<b>1.460817152</b>

Table 4.27A 1<sup>st</sup> dataset (Govt. NOGs and private organizations) 2015-2016

Case No	Code of Govt. Office, NGO, and Private Org.	Forecast of Sustainable Milk Production (Metric Tons)-2015-2016	Forecast of Sustainable Beef Production (Metric Tons)-2015-2016	Actual Milk Production (Metric Tons) 2015-2016	Actual Beef Production (Metric Tons) 2015-2016	Total Milk Production (Metric Tons) in % in 2015-2016	Annual shortage/surplus of milk production in % in 2015-2016	Total Beef Production (Metric Tons) in % in 2015-2016	Annual shortage/surplus of beef production in % in 2015-2016
DLO-1	DLO-1, Gob	9026	7159	8589	7526	95.1584312	<b>-4.841568801</b>	105.1264143	<b>5.126414304</b>
DLO-2	DLO-2, Shib	9750	7875	9987	7975	102.4307692	<b>2.430769231</b>	101.2698413	<b>1.26984127</b>
DLO-3	DLO-3, Bur	6570	7055	6450	6611	98.17351598	<b>-1.826484018</b>	93.70659107	<b>-6.29340893</b>
YC-1	YC	5520.2	2780.5	5690	2650.9	103.0759755	<b>3.075975508</b>	95.33896781	<b>-4.661032188</b>
TMSS-1	TMSS	2828.5	820.5	2990.2	860.2	105.716811	<b>5.716811031</b>	104.8385131	<b>4.838513102</b>

TMSS-2	TMSS	2991.3	1030.5	2950.1	1060.3	98.62267242	<b>-1.377327583</b>	102.8918001	<b>2.891800097</b>
GB-1	GB	2970.3	1230.1	2860.3	1260.3	96.29667037	<b>-3.70332963</b>	102.455085	<b>2.455084952</b>

Based on annual reports published for internal records by government offices, NGOs, and private organizations, individual milk and beef production records related to sustainable production, surplus, and shortage in 2019 and 2020 were examined. The enclosed records are provided below:

Table 4.28A The second dataset (Govt. Office/NGO/Private Org. Published Report-2019-2020)

Case No	DLO-1	DLO-2	DLO-3	YC-1	TMSS-1	TMSS-2	GB-1
Code	DLO-1, Gob	DLO-2, Shib	DLO-3, Bur	YC	TMSS	TMSS	GB
Forecast of Sustainable Milk Production (Metric Tons)-2019-2020	31130	12187.5	8965.95	10515.12	4166.66	4320.02	4280.07
Forecast of Sustainable Beef Production (Metric Tons)-2019-2020	15,558	9208.33	11286.95	5722.09	1276.04	1339.09	1480.5
Actual Milk Production (Metric Tons) 2019-2020	20758	13937.5	9222.84	10780.12	4320.12	4080.01	4467.15
Actual Beef Production (Metric Tons) 2019-2020	18810	9845.83	10502.4	5580.53	1250.5	1520.2	1580.78
Total Milk Production (Metric Tons) in % in 2019-2020	66.68165757	114.3589744	102.8651732	102.5201805	103.6830459	94.44423868	104.3709565
Annual shortage/surplus of Milk Production in % in 2019-2020	<b>-33.31834243</b>	<b>14.35897436</b>	<b>2.865173239</b>	<b>2.520180464</b>	<b>3.68304589</b>	<b>-5.5557613</b>	<b>4.37095655</b>
Total Beef Production (Metric Tons) in % in 2019-2020	120.9024296	106.9230794	93.04905222	97.52607876	97.99849534	113.5248564	106.7733874
Annual shortage/surplus of Beef Production in % in 2019-2020	<b>20.90242962</b>	<b>6.923079429</b>	<b>-6.950947776</b>	<b>-2.47392124</b>	<b>-2.00150466</b>	<b>13.5248564</b>	<b>6.77338737</b>

## Appendix 1.8

Table 3.22D Interview Protocol

Primary Data Sources: Semi-structured interviews				Secondary Data Sources: Archival Research
Propositions	Farmers: 22-25	Government Agents: 8-10	NGOs/Private Sectors: 8-10	Reports: 2015-2020 Production/Volume: <ul style="list-style-type: none"> <li>National Demand for Milk: 15.20 MMT (DLS, 2018)</li> <li>Total Production of Milk: 9.40 MMT (DLS, 2018)</li> <li>Local Demand for Milk:</li> <li>Local Production of Milk:</li> <li>National Demand for Beef: 7.21 MMT (DLS, 2018)</li> <li>Total Production of Beef: 7.26 MMT (DLS, 2018)</li> <li>Local Demand for Beef:</li> <li>Local Production of Beef:</li> </ul>
<i>P4 (Farm-based SE and Ecosystem)</i>	<ul style="list-style-type: none"> <li>Tell me about your farm business (How/ Why and When have you started?).</li> <li>Tell me about the major challenges you faced.</li> <li>Why did you face this problem?</li> <li>Skills and Training (Why/ How?)</li> <li>How do you sell your milk or beef at an average price in the traditional market and dairy cooperative?</li> </ul>	<ul style="list-style-type: none"> <li>Tell me what responsibilities you have for farm-based social entrepreneurship?</li> <li>What is your next scheme for post-COVID-19?</li> <li>How do you want to provide a two-year interest-free loan?</li> <li>Why are its interest-free loans?</li> <li>Why are farmers allowed for this loan without any collateral?</li> <li>Where did you link your farmers for this type of loan?</li> </ul>	<ul style="list-style-type: none"> <li>How did you find milk and beef farmers?</li> <li>Why did you select them?</li> <li>How did you provide them with fruitful training on milk and beef production?</li> <li>Why did you select milk and beef?</li> <li>What credibility basis did you provide initial funding or credit access?</li> <li>How much credit did you provide them to run milk and beef farming initially?</li> </ul>	
Propositions	Farmers: 22-25	Government Agents: 8-10	NGOs/Private Sectors: 8-10	
<i>P1 (Sustainable Food Production and FS)</i>	<ul style="list-style-type: none"> <li>Tell me how much milk per day you produce or yearly beef production you do.</li> <li>Is it enough until the next phase?</li> <li>Was last year's milk or beef production enough to sustain you this year?</li> <li>If not, why not?</li> <li>How did you overcome these?</li> </ul>	<ul style="list-style-type: none"> <li>What is your role?</li> <li>What responsibilities do you have?</li> <li>How do you set your milk/beef production target?</li> <li>Why do you have an annual target?</li> <li>Where do you want to focus your milk/beef production target?</li> <li>Why is it for a specific zone or block?</li> </ul>	<ul style="list-style-type: none"> <li>Please tell me what activities of your NGO/organizations you do.</li> <li>What is your main job?</li> <li>How did you help your farmers to increase milk and beef production?</li> <li>Why did they have less milk or beef production?</li> <li>What were the major challenges your farmers faced?</li> <li>When did it happen?</li> <li>How did they meet the annual milk or beef production target?</li> </ul>	
Propositions	Farmers: 22-25	Government Agents: 8-10	NGOs/Private Sectors: 8-10	

<b>P2</b> ( <i>Sustainable Food Production and SI</i> )	<ul style="list-style-type: none"> <li>• What is your annual average income from this farm business?</li> <li>• Is it enough for next year? Why didn't you have enough?</li> <li>• Do you access additional income sources?</li> <li>• If yes, how did your additional income sources help in milk and beef production?</li> </ul>	<ul style="list-style-type: none"> <li>• How many farmers are you looking at?</li> <li>• How often do you visit them?</li> <li>• Do they sustain milk and beef production? Why don't they sustain?</li> <li>• Do you support them? How did you support them?</li> <li>• Which area do you have sustainable production in your Upazila?</li> <li>• How many farmers have enough milk and beef production?</li> </ul>	<ul style="list-style-type: none"> <li>• Tell me about your role between production and the income of your farmers.</li> <li>• How did you guide and supervise them?</li> <li>• Why did you supervise them?</li> <li>• When did you find their sustainable production?</li> <li>• How did they generate sustainable income?</li> </ul>	
<b>Propositions</b>	<b>Farmers: 22-25</b>	<b>Government Agents: 8-10</b>	<b>NGOs/Private Sectors: 8-10</b>	
<b>P3</b> ( <i>Farm-based SE and Sustainable Food Production</i> )	<ul style="list-style-type: none"> <li>• What is your milk production target per cow per day?</li> <li>• What is the average quantity of your milk production per cow per day?</li> <li>• Is it enough? Why or why not?</li> <li>• What challenges did you face?</li> <li>• How do you want to meet your production target?</li> <li>• What do you think could be better?</li> </ul>	<ul style="list-style-type: none"> <li>• How many farmers improved the amount of milk?</li> <li>• How many of them did not improve the amount of milk?</li> <li>• What were the major challenges they faced?</li> <li>• Why did they face the problem with technical support (e.g. artificial insemination, veterinary services, and fruitful training)?</li> <li>• What kind of problems or limitations did you face?</li> <li>• How did you overcome these?</li> </ul>	<ul style="list-style-type: none"> <li>• How many farmers are successful in milk and beef production?</li> <li>• How many of them are not successful in the production phase?</li> <li>• Why aren't they successful?</li> <li>• What were the major challenges they faced?</li> <li>• How did you help your farmers during the pandemic situation?</li> <li>• How did your farmers survive during COVID-19?</li> </ul>	

**Thank you for your time!**

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Food Security and Social Entrepreneurship: An Investigation into the Bangladesh Agriculture Ecosystem

### Information Sheet for Participation in Research Project

I am a PhD candidate in the Department of Management, Marketing, and Management at the University of Canterbury, New Zealand. My thesis aims to investigate food security and social entrepreneurship in Bangladesh. Specifically, my research question is: How can social entrepreneurship promote regional sustainable food production and food security within a supportive entrepreneurial ecosystem of a developing country?

To answer the above problem, the study sets the following objectives:

1. Establish the current state of food security in Bangladesh.
2. Identify sustainable food production practices that lead to a sustainable income for farm-based social entrepreneurs.
3. Identify the current role that social entrepreneurs play within the agriculture ecosystem.
4. Identify the barriers to social entrepreneurship concerning milk and beef production in Bangladesh.

This study will look at a developing country (Bangladesh) currently experiencing a threat to its sustainable food production and food security due to various factors. The study will identify the barriers to social entrepreneurship in the agribusiness sector, focusing on milk and beef production in Bangladesh. As someone involved in Bangladesh's agribusiness sector, I invite you to participate in this study. If you choose to participate in this study, your involvement will be in granting me a semi-structured interview based on a pre-designed interview protocol. The University of Canterbury Human Ethics Committee in New Zealand

has reviewed and approved this project. In this study, your participation is entirely voluntary. You have the right to withdraw at any study stage without penalty. If you decide to withdraw, I will remove all information related to you. You will receive a copy of the results after completion of this research project if you wish. The results of this study will be published; you can be assured of the complete confidentiality of the participants of this study.

Your recorded data will be secured in an encrypted electronic form to ensure confidentiality. Only the research team will have access to the data. The raw data, such as interview transcripts and the consent form, will be destroyed after ten years. Outputs from this project include lectures, presentations, conferences, and publication of journal articles. The doctoral thesis is considered a public document that will be available at the library of the University of Canterbury.

This project is carried out as a requirement for a Doctor of Philosophy (PhD) by Sayed Ahmed under the supervision of Professor Dr Sussie Morrish and Dr Anna Earl. Professor Dr Sussie Morrish, my primary supervisor, can be contacted at [sussie.morrish@canterbury.ac.nz](mailto:sussie.morrish@canterbury.ac.nz). She will be pleased to discuss any issue or concern you find in this research project. In addition to Ethical Concerns, participants may address any complaints to The Chair, Human Ethics Committee, University of Canterbury, Private Bag: 4800, Christchurch, New Zealand, Email: [human-ethics@canterbury.ac.nz](mailto:human-ethics@canterbury.ac.nz). If you agree to participate in the study, you are asked to complete the consent form and return by email to [sayed.ahmed@pg.canterbury.ac.nz](mailto:sayed.ahmed@pg.canterbury.ac.nz).

Kind Regards,



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