UNDER THE LIVELIHOOD REALITIES OF DUCK FARMERS IN ALAPPUZHA: A QUALITATIVE STUDY OF SOCIO-ECONOMIC AND ENVIRONMENTAL CONSTRAINTS

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ABSTRACT

Duck farming is a traditional wetland-based livelihood for many people in the Alappuzha district of Kerala, especially in the Kuttanad region. It makes a big contribution to food security, household income, and the maintenance of indigenous cultural traditions and knowledge. Duck farming is of ecological and economic importance, but is threatened by socio-economic and environmental problems.

The objective of this research was to understand the experiences of conventional duck farmers in Alappuzha and to identify the major problems affecting their livelihoods. The qualitative research technique has used a number of case study designs. Purposive sampling was done, and seven traditional duck farmers from different communities in the Alappuzha area were selected. The data were collected from secondary sources, field observations, and in-depth semi-structured interviews. Thematic analysis was used to identify important trends and themes. The study employed Vulnerability and Resilience Theory as a framework for analysing risks and coping. ITEK Theory addresses traditional approaches to controlling wetlands and diseases. The theory of livelihood diversification has stressed the importance of alternative income sources to reduce financial stress and ensure the sustainability of duck farming in Alappuzha.

The results indicate that rising input costs, stable market prices for eggs and meat, insufficient and delayed government reimbursements, and the lack of a specific insurance scheme result in severe financial instability for duck farmers. The environment throws things like floods, climate change, and disease outbreaks, such as avian influenza, at farmers, leading to huge economic losses and livelihood instability. The study also highlighted the weaknesses in institutional support, such as irregular veterinary services, poor extension services and challenges in accessing government welfare programs and financing.
Women play an important social role in day-to-day duck farm operations, although their contribution remains undervalued. Low profitability and lack of social recognition make the younger generation less interested in this line of work. There are questions about whether this traditional way of life will continue. Farmers rely on family labour, indigenous knowledge and community cooperation to keep their farming going despite these challenges.

The study concludes that a holistic approach is necessary to ensure long-term sustainability of duck farming. Key recommendations include revising compensation policies, expanding

insurance coverage, offering low-interest credit and subsidized inputs, strengthening veterinary and extension services, developing climate-resilient infrastructure, protecting wetlands, and promoting farmer collectives and community-based disease surveillance. Marrying scientific methods with traditional knowledge to build resilience. The data could help policymakers, researchers and development organisations design context-specific interventions to protect and rejuvenate the traditional duck farmers' livelihoods in Alappuzha.

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CHAPTER I
INTRODUCTION

1.1 Introduction

Duck farming, famous for its unique method of farming below sea level, is one of the major traditional sources of income in Kerala's Alappuzha district, particularly in the Kuttanad region. The region's extensive network of wetlands, backwaters and paddy fields provides a suitable ecological niche for duck breeding (Nair et al., 2019). Rural households in this area have practised duck farming as the main or secondary source of income, food security and employment for many generations. Ducks are raised for meat, eggs and manure, all of which are important to the local economy and household subsistence. It is an economically feasible and environmentally adaptable livelihood that is closely integrated with the natural ecosystem (FAO, 2021), unlike many other livestock farming practices.

Duck farming in Kuttanad is closely linked with the agricultural cycle, especially paddy farming. Ducks are often used in harvested paddy fields to remove remaining grains, insects and aquatic life. This maintains soil fertility, helps with pest management, and saves the farmer money on feed. Such an integrated farming system is a manifestation of traditional ecological knowledge transmitted through generations (Berkes, 2018). It illustrates how rural communities have traditionally evolved sustainable, interdependent livelihood practices to adapt to their environment. In this context, duck farming is not only an economic activity but also a cultural practice that reinforces links to community and local identity. Alappuzha is very important, but it is becoming increasingly difficult to practice duck farming these days. One of the biggest threats is the recurrent outbreak of avian flu (H5N1), also called bird flu. To stop the spread of the disease, these outbreaks frequently lead to widespread duck culling (WHO, 2022). Although culling is essential for public health, farmers suffer immediate and significant financial losses. Farmers are often in financial trouble because of late or insufficient government payments. Fear of disease outbreaks also affects market demand and, in turn, the stability of livelihoods.

Environmental issues are also among the leading causes of vulnerability for duck farmers. The Kuttanad region is highly prone to floods, waterlogging, and seasonal climate variability (IPCC, 2023). Frequent flooding damages duck shelters, disrupts feeding patterns, and increases the risk of disease outbreaks. Climate change compounds these challenges by altering rainfall patterns and increasing weather unpredictability. These challenges are compounded by climate change impacts, such as shifting rainfall patterns and greater weather unpredictability. These challenges are aggravated by the effects of climate change, such as shifting rainfall

patterns and growing unpredictability in weather conditions. These include the worsening impacts of climate change, such as shifting rainfall patterns and greater weather unpredictability. The erratic nature of the environment makes duck farming a risky business, especially for small-scale farmers who lack both the resources to cope with losses and the means to develop adaptive solutions.

Apart from environmental hazards, duck producers also face considerable socio-economic limitations. With feed, medicines and transport costs on the rise, farmers have come under financial pressure, and their profit margins have shrunk. Labour shortages have become a growing concern, as younger generations move away from traditional vocations toward more stable, less physically demanding jobs (Scoones, 2015). Many older farmers are then left to oversee labour-intensive activities like herding and tending duck flocks. Further, access to institutional credit and insurance is limited, leading farmers to rely on informal sources of finance, which sometimes charge exorbitant interest rates and further exacerbate their economic situation vulnerability.

The impact of these difficulties differs from one type of farmer to another. Older farmers commonly face physical limitations and financial insecurity, while women farmers tend to have heavier workloads and additional responsibilities, including household management and caregiving. On the other hand, youth often perceive duck farming as an unstable and unattractive livelihood, which contributes to a gradual decline in participation in the sector. Small-scale farmers are especially vulnerable because they lack the financial capacity to recover from losses caused by disease outbreaks or environmental disasters. Farmers living in flood-prone areas face greater risks, making it more difficult for them to sustain their livelihoods (Cannon & Muller-Mahn, 2010).

Duck farming is not only an economic and environmental problem but also has important emotional and psychological aspects. Farmers are very attached to their animals, and losing ducks to disease or floods can be distressing and cause feelings of helplessness. Crisis after crisis creates uncertainty, which breeds anxiety and affects decision-making at the individual and household levels. Another stressor affecting overall well-being and quality of life is financial instability. Farmers' resilience is demonstrated through a range of coping mechanisms, including reducing flock size, diversifying income and reliance on social support networks, in the face of these obstacles.

Support systems are vital to farmers' ability to cope with adversity. Government agencies, cooperatives and local institutions provide vaccination, training and some financial assistance. However, the effectiveness of such interventions is often diluted by implementation gaps, delays in compensation and inadequate insurance coverage (Srinivasan, 2021). Family, neighbours and community groups often provide the main source of support in a crisis. These networks assist farmers in hedging against risk and recovering from loss, underscoring the importance of social capital in sustaining rural livelihoods.

The existing literature on duck farming has mainly focused on managerial and economic outcomes. However, while these studies offer useful insights into the practicalities of duck farming, they tend to overlook farmers' lived experiences. There is scant research on farmers' perceptions and responses to obstacles, stress coping, and the interaction of socio-economic and environmental factors in their livelihoods (Chambers, 2013). This difference is especially important in places such as Alappuzha, where duck farming is widespread. This division is of particular importance in places like Alappuzha, where ecological, cultural and social aspects are closely associated with duck farming. with ecological, cultural and social forces.

In light of this setting, the present study has adopted a qualitative approach to examine the livelihood reality of duck farmers in Alappuzha. The study aims to provide a holistic picture of the challenges and coping mechanisms in duck farming by examining the experiences of different groups of farmers, such as the aged, women, youth, and small- and large-scale farmers. This is an attempt to capture the voices of farmers and highlight the human dimensions of livelihood vulnerability that are often ignored in policy conversations.
The main objective of the study is to analyse the effect of socio-economic and environmental constraints on the sustainability of duck farming in Alappuzha. It also aims to evaluate the role of institutional support systems and to identify the gaps in existing policies and actions. This helps to promote the development of more inclusive and effective measures to help duck farmers and improve their resilience and livelihood sustainability.

In conclusion, duck farming in Alappuzha is a complex livelihood system shaped by ecological conditions, socio-economic factors, and institutional dynamics. It continues to be a major source of support for the livelihoods of rural households, but is increasingly under threat from a host of interlinked difficulties. Understanding farmers' perspectives is essential for developing sustainable solutions to these problems. Therefore, the study aims to provide an

extensive, in-depth analysis of the livelihood realities of duck farmers, their experiences, vulnerabilities, and resilience to constant change. This analysis aims to shed light on the current state of duck farming and potential directions for innovation and adaptation. Including farmers' voices will enable policymakers to develop more effective strategies to improve sustainability and secure the future of this critical agricultural practice.

1.2 Statement of the Problem

In Alappuzha, duck farming is a traditional livelihood with cultural importance, providing income and food security for many rural families. However, environmental and socio-economic challenges increasingly threaten the sustainability of duck farming in Alappuzha. Due to environmental and socio-economic challenges. Owing to the district's low-lying geography, it is prone to frequent floods and waterlogging, which damage duck shelters, destroy natural feeding areas, and cause high mortality. In addition, climate variability has disrupted breeding patterns and reduced feed availability. Recurrent outbreaks of avian influenza, especially H5N1, have also caused massive losses, with entire flocks being culled, resulting in sudden income losses and psychological distress for farmers. Farmers are facing growing economic pressures in addition to environmental risks. The prices of feed, medicines, vaccines, labour, and transportation have increased considerably, while market prices for ducks and eggs are highly volatile. The majority of farmers are smallholders with little or no savings or access to institutional credit, so they rely on informal loans. Existing government support in the form of compensation, insurance, and subsidies is often inadequate, delayed, or difficult to access. This combination of rising costs and weak institutional support has led to financial insecurity, indebtedness, and a declining interest in continued duck farming among the younger generation.

Duck farming is important to the local economy and culture, but little research has been done on farmers' lived experiences and how they cope with these multiple stressors. However, researchers have largely overlooked the daily struggles, survival strategies, and the impact of these challenges on livelihood sustainability and well-being. Therefore, this study aims to examine the socio-economic and environmental conditions of duck farmers in Alappuzha, understand the coping measures they adopt, and analyze the impact of these issues on the future of duck farming and the health of farming families.

1.3 Background of the Study

The traditional occupation of the Alappuzha district of Kerala, especially in the Kuttanad region, is duck farming. The wetlands, backwaters, and paddy fields in the area provide a natural environment for rearing ducks. Duck farming is a major source of income, employment, and food security for many rural households. The occupation is undertaken by various categories of people, including large-scale, small-scale, women, youth, and farmers in flood-prone areas. All groups have their challenges and experiences. Duck farmers in Alappuzha have been facing many difficulties in recent years. Frequent floods, climate change, and outbreaks of avian influenza have caused heavy losses. However, rising costs of feed, medicines, labour, and transport, coupled with limited compensation, insurance, and institutional support, have placed financial strain on them. These problems have caused many farmers to fall into debt and have made younger people lose interest in continuing duck farming.

Existing studies have only focused on the technical and economic aspects of duck farming. There is very little research on the actual experiences of farmers from diverse backgrounds. Therefore, the present qualitative study focuses on large-scale, small-scale, women, youth, and farmers from flood-prone areas in Alappuzha. The study seeks to investigate their challenges, coping mechanisms, and support structures. The findings will inform the formulation of better policies and sustainable livelihood interventions for duck-farming communities.

1.4 Relevance and Significance of the Study

This study is significant because it offers an in-depth understanding of the lived experiences of duck farmers in Alappuzha. Generalised and data-centric reports often overshadow the lived realities of these farmers. This study explores their daily battles to demonstrate how frequent floods, climate change, and H5N1 outbreaks directly impact income, food security, and emotional health. It also describes how farmers cope, from informal borrowing and community support to changing feeding practices and shows how rising input prices and weak institutional support push many households into debt and uncertainty. These perspectives provide important qualitative depth to the existing literature and help us to understand duck farming as not only an economic activity but also a livelihood tied to culture, identity and family survival. The findings of this study will be useful to policymakers, government departments, NGOs and development agencies working on agriculture and rural livelihoods. This can guide the design of more responsive support programmes such as timely compensation, accessible insurance,

veterinary services and disease surveillance systems tailored to the specific needs of duck farming. The study also emphasises the necessity of climate adaptation measures and sustainable livelihood interventions to build the resilience of farming communities in flood-prone areas. This work provides a base for future researchers to study rural livelihoods, livestock sustainability and climate vulnerability in Kerala. Overall, it helps create more inclusive, farmer-centred policies that safeguard the livelihoods and dignity of duck-farming communities.

1.5 Chapterization

The Chapterization of the dissertation is as follows:

Chapter I: Introduction

Chapter II: Review of literature

Chapter III: Methodology

Chapter IV: Case Description

Chapter V: Thematic Analysis and Discussion

Chapter VI: Findings, Suggestions and Conclusion

CHAPTER II

REVIEW OF LITERATURE

2.1 Introduction

A literature review is a critical and systematic examination of existing academic research related to a particular topic or field of study. Its main purpose is to help the researcher understand what is already known, debates, and the gaps in the current body of knowledge. Frank and Hatak (2014) emphasize that conducting a literature review is the first and most essential step in producing high-quality academic research, as it enables researchers to clearly position their work within the broader academic landscape. By reviewing existing studies, researchers can either identify a knowledge gap or critically question and problematize dominant perspectives in the field.

A literature review goes beyond simple description or summarization of previous studies. It involves analysing, comparing, and synthesising key concepts, theories, findings, and methodological approaches. Arshed and Danson (2015) highlight that a literature review allows researchers to establish what is known and unknown about a subject area, thereby justifying the need for further research. It helps shape research questions, refine a study's focus, and develop theoretical or conceptual frameworks. As Bruce (1994) states, the literature review provides the background and justification for the research, while Nunan (1992) notes that it extracts and synthesises key issues and findings to build a coherent argument leading to the proposed study.

The quality of a literature review is crucial, as it influences the overall strength and credibility of the research. Hart (2009) explains that a good literature review balances depth and breadth, rigour and consistency, clarity and brevity, and effective analysis and synthesis. Poorly conducted reviews often resemble annotated bibliographies, listing studies without critical engagement, which weakens the entire research project.

Literature reviews vary in their purpose, scope, and structure. Common types include traditional or narrative reviews, systematic reviews, meta-analyses, and meta-syntheses. In social science and qualitative research, the traditional or narrative literature review is most commonly used. This approach critically analyses existing literature to identify gaps, inconsistencies, and emerging themes, rather than attempting to include all available studies. Systematic reviews, in contrast, follow a more structured and rigorous method to answer specific research questions, while meta-analysis and meta-synthesis involve statistical and qualitative synthesis of findings, respectively. Overall, a literature review is a foundational component of any research project. It helps researchers clarify their thinking, avoid duplicating

previous work, and contribute meaningfully to existing academic debates by grounding new research in established knowledge. This chapter presents a thematic review of the literature on duck farming, focusing on its ecological, economic, social, and psychological dimensions. The review helps to understand key debates, findings, and gaps in the field, providing the foundation for the present study.

2.2 Review of Literature

Duck Farming in Wetland-Based Agrarian Systems

Duck farming has historically developed in close association with wetland-based agricultural systems, particularly in flood-prone regions where conventional farming is constrained. Studies indicate that ducks are highly adaptable to such ecosystems due to their ability to forage in waterlogged paddy fields and convert natural resources into valuable outputs, such as eggs and meat (Gajendran & Karthickeyan, 2009). In regions such as Kuttanad in Kerala, duck farming is integrated with paddy cultivation, forming a mutually beneficial relationship that enhances soil fertility, pest control, and overall farm productivity (Churchil & Jalaludeen, 2022).

The Integrated Rice–Duck Farming (IRDF) system, popularized in countries such as Japan, China, Vietnam, and the Philippines, demonstrates the ecological and economic benefits of combining rice cultivation with duck rearing (Furuno, 2001). Ducks help control weeds and pests while fertilizing the soil with their droppings, reducing the need for chemical inputs (Mollison, 1988). Despite its proven benefits, Roberts (2008) notes that IRDF has not been widely adopted due to a lack of awareness and institutional support. Experimental studies confirm its effectiveness, but there remains a gap in understanding farmers' perceptions and experiences with such systems.

Duck Farming and Rural Livelihood Security

Duck farming plays a crucial role in sustaining rural livelihoods, particularly among small and marginal farmers. It requires relatively low capital investment and provides quick economic returns, making it accessible to economically vulnerable groups (Kamal et al., 2022). Studies show that duck farming acts as a livelihood buffer during agricultural off-seasons and climate-related shocks (Pervin et al., 2013).

In Kerala, duck farming complements paddy cultivation and wage labour, allowing households to diversify income sources. Women actively participate in various aspects of duck farming,

including feeding, egg collection, and marketing, making it an important gender-inclusive livelihood (Cheriyan & Jacob, 2023). However, despite its significance, duck farming remains under-recognized in policy frameworks, limiting the support available to farmers.

Socio-economic Status and Livelihood of Duck Farmers

Duck farming plays a significant role in sustaining the livelihoods of rural households, particularly among small and marginal farmers. Alam et al. (2012) examined the socio-economic profile of duck farmers in the Rajshahi region and found that factors such as education, occupation, annual income, family size, farm size, and access to training influence the productivity and sustainability of duck farming. The study also highlighted that proper management practices, including housing, feeding, breeding, vaccination, and veterinary care, contribute significantly to farmers' economic outcomes.

Similarly, Kumari et al. (2014) identified duck farming as an effective livelihood strategy for rural communities, particularly for small and marginal farmers, landless labourers, and women. The authors noted that duck farming requires relatively low investment, simple management practices, and provides a regular source of income through the sale of eggs and meat. Lee (2007) further emphasized that small-scale duck farming enhances household food security, diversifies income sources, and serves as a valuable livelihood asset in many developing Asian countries. However, the study also pointed out that inadequate access to technology, market information, and institutional support limits the full livelihood potential of duck farming. These studies collectively indicate that duck farming contributes significantly to rural livelihoods while remaining vulnerable to structural and institutional constraints.

Socio-economic Characteristics and Traditional Duck Farming Practices

Cheriyan and Jacob (2023) examined the socio-economic characteristics and traditional duck farming practices of 40 smallholder duck farmers in the Upper Kuttanad villages of Niranam and Kadapra in Pathanamthitta district, Kerala. The study revealed that duck farming remains a vital source of livelihood for rural households, particularly among small-scale farmers who depend on it either as their primary occupation or as a supplementary income source alongside agriculture. Most farmers belonged to the middle-aged category and had only primary-level education, indicating that formal education was not a prerequisite for engaging in duck farming. Instead, knowledge and skills related to duck rearing were largely inherited from previous generations, making it a traditional family-based occupation.

The researchers found that farmers primarily reared indigenous breeds such as Chara and Chemballi because of their adaptability to the local wetland ecosystem, high survival rate, and relatively low maintenance requirements. Ducks were managed through a free-scavenging system, allowing them to forage naturally in paddy fields, canals, ponds, and wetlands. This traditional farming practice reduced feeding costs while utilizing the natural resources available in the Kuttanad ecosystem. During breeding periods, farmers supplemented the natural feed with rice, wheat, and other cereals to improve egg production. The integration of duck farming with paddy cultivation, fish farming, and cattle rearing demonstrated the ecological and economic significance of traditional integrated farming systems in Kerala.

The study also reported that most farms maintained fewer than 500 ducks, confirming the dominance of smallholder farming in the region. Such farms relied mainly on family labour and locally available resources rather than advanced technologies or commercial production systems. The researchers further observed that women, particularly younger rural women and housewives, were increasingly participating in duck farming. Their involvement contributed not only to household income but also to women's economic empowerment by improving financial independence and decision-making within the family. Thus, the study emphasized that traditional duck farming continues to play an important socio-economic role in sustaining rural livelihoods, preserving indigenous farming knowledge, and supporting gender-inclusive rural development.

Socio-Economic Constraints in Duck Farming

Several studies highlight the socio-economic challenges faced by duck farmers, which significantly affect the sustainability of their livelihoods. Limited access to institutional credit is a major issue, especially for small-scale and nomadic farmers who lack land ownership and formal documentation (Sankaralingam & Mahanta, 2022). As a result, farmers often rely on informal lenders, which can lead to debt cycles.

Rising input costs, including feed, medicines, and transportation, further reduce profit margins (Churchil & Jalaludeen, 2022). Labour shortages have become increasingly common as younger generations move away from traditional occupations. Research from Indonesia indicates that access to credit, technology, and farm size significantly influence farmers' income levels (Setiyawan et al., 2026).

Market-related challenges, such as price fluctuations, limited storage facilities, and reliance on intermediaries, also affect farmers' income stability. Alam et al. (2012) found that low market

prices for duck products remain a major concern among farmers. These cumulative factors contribute to the growing precarity of duck farming as a livelihood.

Economic Importance and Profitability of Duck Farming

Several studies have highlighted duck farming as a profitable agricultural enterprise capable of generating sustainable income. Pangemanan et al. (2014) examined the economic conditions of traditional duck farming households in Indonesia and found that duck farming makes a substantial contribution to household income and financial stability. The study demonstrated that family labour, production decisions, and efficient resource allocation influence profitability.

In Kerala, Abraham and Raveendran (2009) evaluated the Aroor system of sustainable duck rearing, where ducks are fed fresh prawn waste from the seafood processing industry. The researchers concluded that this system significantly reduced production costs while maintaining high egg quality, making it one of the most economical livestock enterprises in the region. Rajput et al. (2014) also described duck farming as a lucrative livestock activity because of its dual income from eggs and meat. Their study highlighted that duck farming in India is predominantly practised by small and marginal farmers using traditional extensive systems, providing a reliable source of livelihood despite limited resources. Together, these studies demonstrate the considerable economic potential of duck farming when supported by efficient management and appropriate market access.

Integrated Duck Farming as a Sustainable Livelihood Strategy

Integrated farming systems have been recognised as an effective approach for improving productivity and sustainability in rural agriculture. Hossain et al. found that integrated rice–duck farming increased rice yields by approximately 20 percent and generated about 50 percent higher net returns compared to conventional rice cultivation. Ducks naturally control weeds and insects while fertilising the fields, thereby reducing production costs and improving ecological sustainability.

Similarly, Cagauan et al. (2000) demonstrated that integrating ducks with rice cultivation, fish farming, and azolla production enhances overall farm productivity while maximising resource utilisation. Sharma and the College of Fishery, Raha also promoted duck–fish farming as a sustainable integrated farming model that increases farmers' income and improves efficient use of available natural resources. These studies suggest that integrated farming not only

strengthens livelihood security but also promotes environmentally sustainable agricultural practices, making it particularly suitable for wetland ecosystems such as Kuttand.

Cheriyan and Jacob (2023) identified numerous livelihood challenges that threaten the sustainability of traditional duck farming in Kerala. The study highlighted that recurrent floods, unpredictable climatic conditions, disease outbreaks, and rising temperatures have become the most serious challenges affecting duck farmers. Although diseases such as Riemerellosis and Colibacillosis were common, farmers reported that floods caused greater economic damage than diseases because large numbers of ducks died, were washed away, or became vulnerable to infections during flood periods. Heat stress during summer also increased mortality, further reducing farmers' productivity and income.

The study further revealed that inadequate veterinary care and poor disease management practices aggravated farmers' problems. Many farmers had limited knowledge regarding disease prevention and relied only on the initial vaccination provided by government duck farms. Booster vaccinations were often neglected because of transportation costs and limited access to veterinary services. As a result, disease outbreaks continued to threaten flock health and increase production losses. These findings indicate the need for better extension services, veterinary support, and awareness programmes to improve farmers' capacity to manage livestock diseases effectively.

Marketing constraints also emerged as a significant livelihood challenge. Most farmers depended on local traders to sell their ducks and eggs because they lacked direct access to markets. This dependence reduced their bargaining power and forced them to sell their products at lower prices. The researchers also observed that ducks were often priced according to quantity rather than body weight, limiting farmers' ability to receive fair economic returns. These market-related issues reduced profitability and discouraged farmers from expanding their enterprises.

Another major concern identified in the study was the absence of insurance coverage for smallholder duck farmers. During floods, disease outbreaks, and other climatic disasters, farmers experienced severe financial losses without receiving adequate compensation or insurance support. The lack of social and financial protection increased the vulnerability of farming households and contributed to the gradual decline in the number of people engaged in traditional duck farming. The researchers concluded that expanding insurance schemes, strengthening veterinary healthcare, improving market access, promoting integrated farming

systems, and implementing climate-resilient support measures are essential for ensuring the long-term sustainability of duck farming and protecting the livelihoods of rural farming communities in Kerala.

Women Empowerment through Duck Farming

Duck farming has emerged as an important livelihood activity contributing to women's economic empowerment. Khanum and Mahadi (2015) investigated the role of duck farming among rural women in Bangladesh and found that women's participation in duck rearing significantly improved household income, financial independence, and decision-making power. The study concluded that duck farming enhances women's socio-economic status while strengthening household livelihood security.

Similarly, Kumari et al. (2014) observed that duck farming is particularly suitable for women because it requires relatively low investment, limited land, and simple management practices. The enterprise enables women to engage in income-generating activities alongside household responsibilities, thereby improving their economic contribution and social status. These findings indicate that promoting women's participation in duck farming can contribute to inclusive rural development, poverty reduction, and gender empowerment.

Environmental Risks and Climate Variability

Environmental risks are central to the challenges faced by duck farmers, particularly in regions like Alappuzha. Floods, waterlogging, and unpredictable rainfall patterns disrupt farming activities, damage infrastructure, and increase vulnerability to disease (Shoja Rani & George, 2022).

Climate change has further intensified these risks by altering ecological conditions and reducing the availability of natural foraging resources. Wetland degradation and pollution also limit the sustainability of traditional duck farming practices. Studies emphasize that environmental stress not only causes immediate economic losses but also weakens long-term adaptive capacity among farmers, especially those with limited resources.

Disease Outbreaks and Avian Influenza (H5N1)

Avian Influenza (H5N1) is one of the most serious threats to duck farming livelihoods. Research shows that wetlands, migratory bird pathways, and open grazing systems increase the risk of disease transmission (Prosser et al., 2013; Huang et al., 2016). In Kerala, dense duck populations and close interaction with natural water bodies further heighten vulnerability (Cheriyan & Jacob, 2023).

Government interventions such as mass culling and movement restrictions, while necessary for disease control, often result in severe income losses and livelihood disruptions. Arram (2014) highlights that delays in compensation and bureaucratic procedures exacerbate farmers' distress. Scholars argue that avian influenza should be addressed not only as a health issue but also as a socio-economic crisis requiring integrated policy responses (Prasada Rao, 2017).

Integrated Farming Systems and Sustainability

Integrated farming approaches, such as the rice–duck system, have been recognised as sustainable agricultural innovations. Vipriyanti et al. (2021) found that integrating ducks into rice fields improves production efficiency and reduces the use of chemical inputs. Similarly, studies from the Philippines highlight the economic, environmental, and health benefits of integrated systems, including increased rice yield and reduced dependence on pesticides (Pacamalan, 2001).

These systems demonstrate how traditional knowledge can be combined with modern practices to enhance sustainability. However, research also indicates that adoption remains limited due to a lack of awareness, technical knowledge, and institutional support.

Disease Outbreaks and Avian Influenza (H5N1)

Disease outbreaks, particularly Avian Influenza (H5N1), have emerged as one of the most significant threats to the livelihoods of duck farmers. Prosser et al. (2013) and Huang et al. (2016) reported that wetlands, migratory bird flyways, and open grazing systems increase the risk of disease transmission among duck populations. In Kerala, where ducks are traditionally reared in wetlands and paddy fields, the close interaction between domestic ducks, migratory birds, and natural water bodies further increases the vulnerability to infectious diseases. Cheriyan and Jacob (2023) also emphasized that climate change and disease outbreaks have become major challenges to the sustainability of traditional duck farming. Their study found that recurrent floods, irregular rainfall, rising temperatures, and monsoon-related diseases

caused significant duck mortality and financial losses among smallholder farmers. Flooding not only resulted in the loss of ducks but also contaminated water sources, increasing the incidence of diseases such as Riemerellosis and Colibacillosis, while heat stress during summer further reduced productivity and income.

Government measures such as mass culling, movement restrictions, and temporary bans on duck transportation are essential for controlling Avian Influenza outbreaks but often create severe livelihood disruptions. Arram (2014) observed that delays in compensation and complex bureaucratic procedures intensify the economic hardship experienced by affected farmers. Similarly, Prasada Rao (2017) argued that Avian Influenza should be addressed not only as an animal health concern but also as a socio-economic crisis affecting the livelihood security of farming communities. The author emphasized the need for integrated policy responses, including timely compensation, effective disease surveillance, improved veterinary support, livestock insurance, and climate-resilient farming practices. Together, these studies demonstrate that disease outbreaks and Avian Influenza pose multidimensional challenges that threaten the sustainability and resilience of duck farming livelihoods.

Vulnerability, Resilience, and Adaptation Strategies

The vulnerability of duck farmers arises from the interaction of socio-economic and environmental factors. Studies from South and Southeast Asia show that farmers adopt various coping strategies, such as reducing flock size, diversifying income sources, and relying on informal support networks (Pervin et al., 2013).

Community-based practices, including shared grazing and mutual assistance, play an important role in enhancing resilience. Wu et al. (2021) emphasize the importance of social capital in strengthening farmers' adaptive capacity. However, limited access to information, veterinary services, and institutional support restricts long-term adaptation.

Psychological and Emotional Dimensions

Recent literature highlights that livelihood challenges in agriculture affect not only farmers' economic conditions but also their psychological and emotional well-being. Repeated exposure to environmental disasters, disease outbreaks, and financial uncertainty often results in stress, anxiety, fear, and emotional exhaustion among farming communities. Delpont et al. (2021) noted that continuous livelihood shocks reduce farmers' confidence in their future, creating uncertainty and negatively affecting their mental health. These psychological impacts are

particularly severe among smallholder farmers who have limited financial resources and fewer opportunities to recover from losses.

In the context of traditional duck farming, Cheriyan and Jacob (2023) observed that many farmers continue duck rearing not only as a source of income but also as a family tradition and way of life. The study found that recurrent floods, climate variability, rising temperatures, and disease outbreaks caused significant duck mortality and financial losses, leading to emotional distress and insecurity among farmers. Many respondents remained committed to duck farming despite economic losses because of their emotional attachment to the occupation and the ducks they had reared for years.

The literature also indicates that women engaged in duck farming experience additional emotional burdens as they balance farming activities with household responsibilities. Financial instability, uncertainty about future income, and repeated livelihood losses increase anxiety and psychological stress among farming families. These findings suggest that livelihood research should move beyond economic indicators and incorporate mental health and psychosocial well-being. Strengthening social support systems, counselling services, timely compensation, and institutional assistance can improve both the resilience and overall well-being of duck farming households**.**

Role of Support Systems and Institutional Interventions

Institutional support plays a key role in shaping farmers' resilience and recovery. Government agencies provide services such as vaccination, training, and financial assistance, while organizations like cooperatives and NGOs help strengthen market access and collective action (Ganesh Ram Jat et al., 2023).

However, the literature identifies several gaps, including delayed compensation, insufficient insurance coverage, and inadequate coordination among agencies. Informal support systems, such as family and community networks, often serve as the primary source of assistance during crises (Letha & Jacob, 2023).

Attitude Towards Scientific Duck Farming

Nija George et al. (2017) examined the attitudes of duck farmers in Kuttanad towards scientific duck farming to understand their willingness to adopt improved farming practices. The study found that 42.67% of farmers had a favourable attitude, while 29.33% were somewhat favourable and 28% had an unfavourable attitude. Although the largest group held positive

perceptions, the combined proportion of somewhat favourable and somewhat unfavourable farmers suggests that many remain hesitant to fully embrace scientific methods. The authors argued that farmers' attitudes significantly influence the adoption of modern technologies, productivity, and long-term sustainability of duck farming. They concluded that improving farmers' perceptions through awareness and education is essential for encouraging scientific practices and ensuring the future growth and resilience of the duck farming sector in Kerala.

Socio-economic and Environmental Factors Influencing Duck Farming

Nija George et al. (2017) highlighted in the study is that duck farming in Kuttanad is undergoing significant changes due to socio-economic transformation and environmental pressures. Traditionally, duck farming was integrated with paddy cultivation, allowing ducks to forage naturally in harvested fields. However, changing land-use patterns, declining paddy cultivation, commercialization, and environmental changes have reduced the availability of suitable grazing areas. These developments have created challenges for sustaining traditional duck farming systems and have influenced farmers' perceptions of scientific farming practices. The authors observed that despite modernization, many farmers still preferred traditional nomadic and foraging methods because of familiarity and local conditions. The study emphasised that sustainable development of duck farming requires addressing these socio-economic and environmental challenges while promoting scientific innovations suited to local farming systems.

Factors Affecting Adoption of Scientific Practices

Nija George et al. (2017) assessed farmers' attitudes towards twelve key aspects of scientific duck farming, including profitability, marketability, value addition, disease management, labour, housing, women empowerment, awareness creation, low-cost technology, social status, social stigma, and land availability. The findings showed that farmers generally held positive views regarding profitability, market opportunities, and awareness programmes. However, land availability emerged as the only aspect with a significant difference between Lower and Upper Kuttanad farmers. Farmers in Upper Kuttanad faced greater constraints due to shrinking paddy fields and limited foraging areas. The study suggested that improving access to resources, strengthening disease management, and providing technical guidance can encourage wider adoption of scientific duck farming practices and improve productivity and sustainability.

Need for Extension Services and Capacity Building

Nija George et al. (2017) The study concluded that extension services and farmer training play a crucial role in promoting scientific duck farming. Since a considerable proportion of farmers remained uncertain or hesitant about adopting improved practices, the authors recommended implementing need-based extension programmes and awareness campaigns. These initiatives should focus on demonstrating the benefits of scientific duck farming, improving disease management, increasing productivity, and encouraging value addition. The researchers also stressed the importance of motivating younger generations and new entrepreneurs to participate in duck farming by providing technical knowledge and practical training. Strengthening extension support can help farmers overcome misconceptions, improve their confidence in scientific methods, and ensure the long-term sustainability and profitability of duck farming in Kuttanad and other wetland regions of Kerala.

2.3 Theoretical Framework

Vulnerability and Resilience Theory

Neil Adger (2006) developed the Vulnerability and Resilience Theory to understand how individuals and communities experience and respond to environmental and socio-economic stressors. The theory proposes that vulnerability is a function of three elements: exposure to hazards, sensitivity to those hazards, and adaptive capacity to cope and recover. Resilience refers to the ability of a system to absorb disturbances, adapt to change, and maintain core functions. This framework is highly applicable to the present study on duck farmers in Alappuzha. Farmers are consistently exposed to environmental shocks such as floods, heavy rainfall, climate variability, and avian influenza outbreaks that cause large-scale mortality and infrastructure damage. Their sensitivity is high because duck farming is a primary, wetland-dependent livelihood with narrow profit margins and no alternative income during crisis periods. Adaptive capacity is constrained by the absence of a dedicated insurance scheme, inadequate veterinary services, delayed government compensation, and poor access to institutional credit. Despite these challenges, farmers exhibit resilience by depending on Indigenous knowledge, family labour, and community solidarity. Therefore, this theory provides a strong basis to analyze both the risks that make farmers vulnerable and the coping mechanisms they use to sustain their livelihoods.

Indigenous and Traditional Ecological Knowledge (ITEK) Theory

The Indigenous and Traditional Ecological Knowledge framework was systematically articulated by Fikret Berkes (1957). ITEK refers to the knowledge, practices, and beliefs that have evolved in local communities through long-term interaction with their natural environment. It encompasses ecological observations, seasonal forecasting, resource management, and context-specific, intergenerational adaptive practices. This theory is central to understanding traditional duck farming in Alappuzha, especially in the Kuttanad wetland region. Farmers possess extensive knowledge of seasonal grazing routes, water management, breeding cycles, natural disease indicators, and flood-adaptation strategies. They manage flocks with minimal external inputs by utilizing local ecosystems, moving ducks across paddy fields and canals, and using traditional methods for disease control. Women play a crucial role in daily operations and in transmitting this knowledge within households. However, the continuity of ITEK is threatened by climate change, wetland conversion, recurring disease outbreaks, and declining interest among younger generations due to low profitability and lack of recognition. The ITEK perspective thus helps explain how traditional ecological wisdom enables farmers to cope with environmental constraints, and why preserving and integrating this knowledge with scientific approaches is essential for sustainable duck farming.

Livelihood Diversification and Risk Management Theory

Frank Ellis (2000) developed the Livelihood Diversification and Risk Management Theory to explain why rural households pursue multiple livelihood activities. According to Ellis, diversification is a strategy used to reduce risk, smooth income, and improve economic security, particularly in contexts where agriculture is uncertain and vulnerable to external shocks. Diversification may be driven by “push” factors such as poverty, crop failure, and crises, or “pull” factors such as new market opportunities. This theory is directly relevant to duck farmers in Alappuzha who face increasing economic pressure. Rising costs of feed and medicine, stagnant market prices, recurring disease losses, and climate-induced floods are major push factors threatening household income and food security. As a result, many families are compelled to seek alternative sources of income, such as daily-wage labour or migration. However, opportunities for diversification remain limited due to insufficient financial capital, inadequate skills training, weak market linkages, and reliance on wetland-specific farming. Ellis’s framework justifies the need for targeted policy interventions including low-interest credit, skill development programs, farmer cooperatives, and support for value-added duck

products. Thus, the theory explains why diversification is necessary to reduce risk and ensure long-term livelihood security.

2.4 Research Gap Analysis

Most of the existing studies on duck farming in Kerala and other parts of India have focused primarily on technical, economic, and veterinary aspects. Research has primarily focused on feed efficiency, egg and meat production, disease management, and market linkages. While these studies provide important quantitative data, they do not explore how farmers experience and manage the challenges of duck farming in their daily lives. The human dimension of this livelihood remains largely unexplored**.**

There is very limited qualitative research on the lived experiences of duck farmers, especially in a disaster-prone, wetland-based district such as Alappuzha. The emotional stress, financial insecurity, coping strategies, and perceptions of government support among farmers are poorly documented. Furthermore, duck farming is not practised by a single homogenous group. Large-scale farmers, small-scale farmers, women farmers, youth farmers, and farmers from flood-prone areas each face distinct risks and pressures. However, current literature does not differentiate these experiences or examine how vulnerability varies across these groups**.**

Because of this gap, policies and support programmes are often designed without understanding farmers' real needs and realities. This leads to interventions that are general and less effective. Therefore, this study addresses the gap by adopting a qualitative approach to document the voices and experiences of diverse categories of duck farmers in Alappuzha. By exploring the socio-economic, environmental, and psychological dimensions of their livelihood, the study aims to generate knowledge that can contribute to more inclusive, responsive, and sustainable policy measures for duck farming communities in Kerala.

CHAPTER - 3

METHODOLOGY

3.1 Introduction

Research methodology provides the systematic framework through which a study is designed, data are collected, and findings are analyzed. It serves as the foundation for conducting credible and ethical research across disciplines. Kumar (2018) states that research methodology is taught as a supporting subject in many academic fields, including health, education, psychology, social work, nursing, public health, and social sciences. Although these disciplines differ in content, their broad approach to research inquiry remains similar.

According to Kumar (2018), research can be conducted using qualitative, quantitative, or mixed methods approaches. Quantitative research follows a structured process, whereas qualitative research is more flexible and allows for an in-depth exploration of experiences and meanings. Kumar (2018) argues that both approaches are important for portraying a complete picture of any social phenomenon, and that researchers should develop competence in both. He further suggests that in practice, most research involves elements of both approaches. Similarly, Davidavičienė (2018) notes that scientific research is grounded in problem-solving principles and requires clarity regarding assumptions about reality, knowledge, and human nature. She also highlights that digital tools and emerging methodologies have changed the way research is conducted today**.**

For social science studies, especially those focused on livelihoods and lived experiences, qualitative methods are essential. Bisaria, Kumari, and Patel (2026) explain that research methodology encompasses tools such as interviews, observations, questionnaires, and case studies, as well as sampling and analytical techniques to ensure validity and reliability. Mishra and Alok (2022) add that despite disciplinary differences, the core philosophical base of research remains consistent across fields**.**

Given the objectives of this study, a qualitative research approach is adopted to understand the socio-economic, environmental, and psychological dimensions of duck farming in Alappuzha. This approach is appropriate because the study seeks to document farmers' voices, experiences, and coping strategies rather than to test hypotheses through numerical measurement**.**

This chapter explains the research methodology adopted for the study titled "Understanding the Livelihood Realities of Duck Farmers in Alappuzha: A Qualitative Study of Socioeconomic and Environmental Constraints." It outlines the research approach, design, study area, sampling methods, data collection techniques, and data analysis procedures used to achieve the study's objectives. The chapter also discusses the limitations and ethical considerations of the research.

3.2 Title of the study

Under the livelihood realities of duck farmers in Alappuzha: a qualitative study of socio-economic and environmental constraints

3.3 Research Questions

GENERAL RESEARCH QUESTION

What are the lived livelihood realities of duck farmers in Alappuzha in the context of socioeconomic and environmental constraints?

SPECIFIC RESEARCH QUESTIONS

- What are the key socioeconomic challenges faced by duck farmers in Alappuzha?
- How do environmental factors such as f bods, climate variability, and disease outbreaks af éct duck farming livelihoods?
- How do economic pressures like rising input costs, labour shortages, and market f luctuations inf Lience farming sustainability?
- How do duck farmers perceive and respond to government policies, compensation mechanisms, and institutional support?
- What coping and adaptation strategies do farmers adopt to manage recurring livelihood challenges?

3.4 Definition of Concepts

Livelihood

- **Conceptual Definition:** Livelihood comprises the capabilities, assets, and activities required for a means of living. It includes the resources and strategies that enable individuals and households to cope with stresses and shocks while maintaining or improving their well-being (Chambers & Conway, 1992).
- **Operational Definition:** In this study, livelihood refers to the income-generating activities and survival strategies of duck farmers in Alappuzha, with duck rearing serving as their primary or supplementary source of income.

Socio-economic Constraints

- **Conceptual Definition:** Socio-economic constraints are the social and economic barriers that limit individuals' and communities' ability to achieve sustainable

livelihoods, including low income, limited access to markets, labour shortages, inadequate institutional support, and financial insecurity (United Nations Development Programme [UNDP], 2015).

- **Operational Definition:** In this study, socio-economic constraints refer to the financial difficulties, rising feed and vaccination costs, labour shortages, inadequate insurance coverage, delayed government assistance, and unstable market prices experienced by duck farmers in selected areas of Alappuzha.

Environmental Constraints

- **Conceptual Definition:**

  Environmental constraints are ecological and climatic conditions, such as floods, pollution, disease outbreaks, and habitat degradation, that adversely affect agricultural production and rural livelihoods (Food and Agriculture Organization [FAO], 2010).

- **Operational Definition:**

  In this study, environmental constraints refer to flooding, water contamination, disease outbreaks, seasonal changes, and other environmental factors that influence duck farming practices in the Kuttanad wetland region of Alappuzha.

Duck Farming

- **Conceptual Definition:**

  Duck farming is a branch of poultry farming that involves the breeding, rearing, and management of ducks for the production of eggs, meat, and other by-products. It is an important livelihood activity in many wetland-based agricultural systems (FAO, 2010).

- **Operational Definition:**

  In this study, duck farming refers to the traditional and semi-traditional rearing of indigenous Chara and Chemballi duck breeds by farmers in Anary, Chennithala, Pallipad, Cheruthana, Veeyapuram, Mannar, and Karuvatta in Alappuzha district.

Reality

- Conceptual Definition:

  Reality refers to the lived experiences, perceptions, meanings, and everyday conditions through which individuals understand and interpret their social world. In qualitative research, reality is viewed as being constructed through people's experiences and interactions (Teherani et al., 2015).

- **Operational Definition**:

In this study, reality refers to the day-to-day lived experiences, socio-economic and environmental challenges, coping strategies, and perceptions of duck farmers in Alappuzha as expressed during in-depth interviews.

3.5 Pilot study

A pilot study was conducted prior to the main data collection to assess the relevance, clarity, and feasibility of the semi-structured interview guide. Conducting a pilot study in qualitative research helps refine research instruments and ensures that the interview questions generate meaningful and context-specific information (Teherani et al., 2015). For this study, two duck farmers from Pallipad and Veeyapuram in Alappuzha district were purposively selected and interviewed using the draft interview schedule. During the pilot study, the researcher also observed the flood-prone areas where duck farming is practiced to understand the environmental conditions affecting the farmers' livelihoods. At the time of the pilot study, concerns regarding the H5N1 avian influenza (bird flu) outbreak were prevalent in the study area. The researcher gathered preliminary information on how the outbreak had affected duck farming, including farmers' concerns about duck mortality, restrictions on duck movement, financial losses, and the fear of disease transmission. The pilot interviews helped determine whether the questions on socio-economic and environmental constraints were clearly understood and relevant to the participants' lived experiences.

The pilot study provided valuable insights into both the interview process and the field setting. It highlighted the importance of building rapport before discussing sensitive issues such as income, debt, government assistance, and losses caused by the H5N1 outbreak. Field observations in the flood-prone areas further enhanced the researcher's understanding of the effects of seasonal flooding, waterlogging, and disease outbreaks on duck farming practices. Based on the feedback received, several interview questions were simplified in Malayalam, and additional probing questions on disease management, the impact of H5N1 avian influenza, government compensation, flood management, and farmers' coping strategies were incorporated into the interview guide. As noted by De Vaus (2001), pilot testing strengthens research quality by ensuring that the research tools are aligned with the objectives of the study. The pilot study confirmed that the interview guide was appropriate for the main study with only minor modifications.This version naturally incorporates the H5N1 avian influenza outbreak and your field observation of flood-prone areas, making it more specific to your research context in Alappuzha.

3.6 Research Design

For this study, a qualitative research approach is adopted to explore the lived experiences, challenges, and coping strategies of duck farmers in Alappuzha. A qualitative approach is appropriate when the aim is to understand meanings, perceptions, and social processes rather than to measure variables (Teherani et al., 2015). According to Mulisa (2022), the choice of research approach must be guided by the study's research objective and philosophical assumptions. Qualitative research is grounded in interpretive ontology and epistemology and is widely used for theory building and generating in-depth, context-specific knowledge (Singh, 2015). Johnston (2014) emphasises that rigour in research requires alignment between theory, philosophy, and method. In addition, reflexivity is central to qualitative inquiry as it involves ongoing interaction between the researcher and the research context (Attia & Edge, 2017). Therefore, this approach enables the study to capture the socio-economic, environmental, and psychological dimensions of duck farming from farmers' perspectives.

Research design refers to the overall plan and structure that guides a study from formulating research questions to collecting and analyzing data (Creswell, 2014). It outlines the logic of inquiry by specifying what data is needed, how it will be collected, and how it will be analyzed to answer the research problem (Khamidov, n.d.). Research design provides coherence between philosophical assumptions, research objectives, and methods (De Vaus, 2001). It can be exploratory, descriptive, explanatory, or evaluative. A descriptive research design is used when the aim is to provide an accurate and detailed account of people, events, or situations in their natural context without manipulating variables (Khamidov, n.d.). This design is particularly suitable for qualitative studies that seek to understand and interpret lived experiences.

In this study, a descriptive qualitative research design is adopted. The objective of the study is to describe and interpret the socio-economic, environmental, and psychological realities of duck farmers in Alappuzha. A descriptive design is most appropriate because it allows the researcher to capture the complexity of farmers lived experiences within the Kuttanad wetland ecosystem without imposing pre-determined categories. The study employs a case study method supported by in-depth semi-structured interviews to collect detailed, context-specific information from 7 selected duck farmers. This design provides flexibility and depth, enabling the researcher to understand participants' challenges, coping mechanisms, and everyday farming practices in their natural setting.

3.7 Description of Research Site and Participants

Research site:

The study was conducted in selected regions of Alappuzha district, Kerala, with a specific focus on the Kuttanad wetland ecosystem, which is widely recognized for its long-standing tradition of duck farming. The selected areas include Anary, Chennithala, Pallipad, Cheruthana, Melppadam,Veeyapuram, Mannar, and Karuvatta. Alappuzha is a coastal district characterized by low-lying paddy fields, backwaters, and frequent flooding, which makes it ecologically suitable for duck rearing but also highly vulnerable to environmental risks. These regions were purposively selected because duck farming is practised here by diverse groups, including large-scale farmers, small-scale farmers, women, youth, and farmers from flood-prone areas. The recurring challenges of floods, disease outbreaks, and market fluctuations in these areas directly affect farmers' livelihoods and make them relevant contexts for understanding the socio-economic and psychological dimensions of duck farming.

Participants:

The participants in this study comprised 15 duck farmers residing in the selected villages of Alappuzha district. Participants were selected through purposive sampling to ensure the inclusion of information-rich cases relevant to the research objectives. The sample included both large-scale and small-scale duck farmers, representing diverse socio-economic and educational backgrounds. Participants had 5 to 45 years of experience in duck farming and included youth, middle-aged adults, elderly farmers, and women, thereby reflecting the diversity of the duck farming community in Alappuzha. Some participants depended on duck farming as their primary livelihood, while others practiced it as a supplementary occupation. All participants were informed about the purpose of the study, assured of confidentiality and voluntary participation, and provided informed consent before the interviews were conducted.

3.8 Sampling Strategy

The study adopted a purposive sampling strategy, which is a non-probability sampling method commonly used in qualitative research to select participants who possess specific knowledge and experience relevant to the research topic (Patton, 2015). Purposive sampling enabled the researcher to identify duck farmers who were actively engaged in duck farming and had

firsthand experience of the socioeconomic and environmental challenges affecting their livelihoods in Alappuzha district.

The selection of participants was based on predetermined criteria, including active involvement in duck farming, willingness to participate in the study, and the ability to provide detailed information regarding livelihood practices, environmental constraints, disease outbreaks, and coping strategies. To capture diverse perspectives, the sample included small-scale farmers, large-scale farmers, elderly farmers, women farmers, and farmers residing in flood-prone areas.

A total of seven (7) duck farmers were selected for the main study. The sample size was determined based on the principle of data saturation, where no substantially new themes or information emerged from additional interviews (Guest et al., 2006). This sampling strategy ensured the collection of rich, in-depth, and context-specific data that addressed the objectives of the study.

3.9 Data Collection

Data collection is a crucial stage in qualitative research as it enables the researcher to gather detailed information about participants' lived experiences, perceptions, and challenges within their natural context (Patton, 2015). In this study, data were collected from duck farmers in Alappuzha district using multiple qualitative methods to obtain a comprehensive understanding of their livelihood realities, socioeconomic conditions, and environmental constraints.

The researcher collected data through **semi-structured in-depth interviews, case studies, and field observations**. The use of multiple methods helped to achieve **triangulation** by comparing information obtained from different sources and improving the credibility of the findings.

Primary data were collected directly from seven selected duck farmers who had firsthand experience in duck farming. The interviews were conducted at the participants' homes or farm locations in a comfortable and familiar environment. The interviews were conducted mainly in Malayalam to allow participants to express their experiences and opinions freely. Each interview lasted approximately **30–45 minutes** and focused on areas such as farming practices, livelihood challenges, economic difficulties, environmental risks, disease outbreaks, government support, and coping strategies.

Case studies were developed for each participant to explore individual experiences in depth. The case study approach helped document variations in farmers' socioeconomic backgrounds, farming systems, challenges faced, and adaptation strategies.

Field observations were also conducted during farm visits to understand the physical and environmental conditions influencing duck farming. The researcher observed aspects such as wetland conditions, flood impacts, duck housing, feeding practices, farm management, and other environmental factors affecting farmers' livelihoods. Field notes and photographs were documented with prior consent from participants.

Secondary data were collected from relevant sources, including academic books, journal articles, government reports, policy documents, and reliable online sources. These sources provided theoretical background and contextual information related to duck farming, sustainable livelihoods, climate vulnerability, and disease-related challenges.

The combination of primary and secondary data sources enabled a detailed exploration of the livelihood realities of duck farmers in Alappuzha and supported a comprehensive analysis of socioeconomic and environmental constraints.

3.10 Data Analysis

The collected qualitative data were analysed using **thematic analysis**, a systematic approach for identifying, organizing, and interpreting meaningful patterns within qualitative data (Braun & Clarke, 2006). Thematic analysis was selected as it allows the researcher to explore the lived experiences, perceptions, challenges, and coping mechanisms of duck farmers in relation to their livelihood realities.

The analysis process involved a detailed examination of interview transcripts, case study narratives, and field observation notes. The researcher followed the six-phase approach of thematic analysis proposed by **Braun and Clarke (2006)**, which includes familiarization with data, generating initial codes, developing themes, reviewing themes, defining and naming themes, and producing the final report.

The data analysis was conducted through the following stages:

1.Data Familiarisation

The researcher became familiar with the collected data by repeatedly reading the interview transcripts, case study records, and field notes. During this stage, important observations, significant statements, and initial ideas related to farmers' experiences were identified. The audio recordings were transcribed carefully, and responses collected in Malayalam were translated into English while maintaining the original meaning of participants' narratives.

2. Generation of Initial Codes

The transcripts were systematically reviewed, and meaningful segments of information were assigned codes. Coding helped to organize the large volume of qualitative data into manageable categories. Codes were developed based on recurring ideas related to socioeconomic conditions, environmental challenges, disease outbreaks, institutional support, and adaptation strategies.

Examples of initial codes included:

- Rising input costs
- Income instability
- Flood-related losses
- Duck mortality due to disease
- H5N1 outbreak impacts
- Lack of insurance support
- Government compensation issues
- Traditional farming practices
- Coping and adaptation strategies

3. Development of Themes

The identified codes were compared and grouped into broader themes that represented the major dimensions of farmers' livelihood experiences. The themes were developed based on similarities, relationships, and patterns emerging from the data.

The major themes identified included:

- **Socioeconomic Challenges:**
  This theme explored financial difficulties, increasing production costs, labour shortages, market uncertainties, and income-related problems faced by duck farmers.
- **Environmental Constraints and Climate Risks:**
  This theme focused on challenges associated with floods, waterlogging, wetland changes, and environmental vulnerabilities affecting duck farming practices.

- **Disease Outbreaks and Health Risks:**
  This theme examined the impact of H5N1 avian influenza outbreaks, duck mortality, movement restrictions, disease prevention practices, and economic losses experienced by farmers.
- **Institutional Support and Policy Challenges:**
  This theme analysed farmers' experiences regarding government assistance, compensation mechanisms, veterinary services, and access to institutional support.
- **Coping Strategies and Adaptation Practices:**
  This theme highlighted the methods adopted by farmers to overcome challenges, including traditional knowledge, diversification, modifying farming practices, and community support.

4. Review and Refinement of Themes

The developed themes were reviewed to ensure that they accurately represented the collected data and addressed the objectives of the study. Similar themes were combined, irrelevant categories were removed, and themes were refined to establish clear relationships between different aspects of duck farmers' livelihood experiences.

5. Interpretation of Findings

The final themes were interpreted in relation to the research objectives and supported with participants' narratives and field observations. The findings were compared with existing literature on sustainable livelihoods, vulnerability, climate risks, and livestock-based livelihood systems to develop a deeper understanding of the challenges faced by duck farmers.

6. Presentation of Findings

The analysed data were presented through thematic descriptions, case study narratives, and selected participant quotations. This approach helped to represent the voices and lived realities of duck farmers while maintaining confidentiality and ethical standards.

The use of thematic analysis enabled the researcher to develop a comprehensive understanding of the socioeconomic and environmental constraints influencing the livelihoods of duck farmers in Alappuzha. The integration of interviews, case studies, and field observations strengthened the reliability and depth of the findings through methodological triangulation.

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3.11 Ethical Considerations

Ethical considerations were given utmost importance throughout the research process to protect the rights, dignity, privacy, and well-being of all participants. Before data collection, the study's purpose, objectives, and procedures were clearly explained, and informed consent was obtained from each participant. Participation was entirely voluntary, and participants were informed of their right to withdraw from the study at any stage without any negative consequences. Confidentiality and anonymity were maintained by removing personal identifiers, and all information collected was used solely for academic purposes. Photographs were taken only after obtaining the participants' prior consent and were used exclusively for research documentation while respecting their privacy and dignity. Interviews were conducted at locations convenient to the participants, ensuring a comfortable and non-threatening environment. All data were stored securely and accessed only by the researcher to maintain confidentiality and prevent unauthorized use of the information.

3.12 Limitations, Assumptions and Scope

Like any qualitative inquiry, this study has certain limitations that should be considered while interpreting the findings:

- Small sample size: The study includes only 7 respondents. Due to the qualitative and case-based nature of the research, the findings cannot be statistically generalized to all duck farmers.
- Time constraints: Limited fieldwork time affected the number of visits and the depth of engagement with each farmer. A longer duration could have allowed for seasonal variations in farming practices to be captured.
- Geographical scope: The study is restricted to Alappuzha district. The socio-economic, environmental, and cultural conditions here differ from other duck farming regions in Kerala and India, so results may not be applicable elsewhere.
- Subjectivity of data: Data are based on farmers' personal experiences, perceptions, and recall. These narratives may be influenced by individual bias, memory, and social desirability.
- Language and interpretation: Interviews were conducted in Malayalam and later translated into English. Some local terms and meanings may have lost nuance during translation and interpretation.
- Despite these limitations, the study provides rich, context-specific insights into the lived experiences, challenges, and coping strategies of duck farmers in Alappuzha.

Assumptions of the Study

The study is based on the following assumptions:

- It is assumed that the selected duck farmers provided honest, accurate, and reliable information based on their lived experiences.
- It is assumed that the participants possess adequate knowledge and experience in duck farming to share meaningful insights into livelihood challenges.
- It is assumed that qualitative interviews are appropriate for understanding the socio-economic, environmental, and emotional dimensions of duck farming.
- It is assumed that the experiences shared by the participants reflect the realities of duck farmers in the selected study areas of Alappuzha.
- It is assumed that factors such as disease outbreaks, floods, rising input costs, labour shortages, and market fluctuations significantly influence the livelihoods of duck farmers.
- It is assumed that government support, community networks, and individual coping strategies play an important role in shaping farmers' resilience and adaptation.

Scope of the Study

The scope of this study is limited to understanding the livelihood challenges of duck farmers in selected villages of Alappuzha district, Kerala. The study focuses on the socio-economic, environmental, and emotional challenges experienced by duck farmers and explores the strategies they adopt to cope with these difficulties. It includes farmers with varying scales of duck farming and different years of experience to capture diverse perspectives.

The research specifically examines issues such as disease outbreaks, floods, rising production costs, labour shortages, market fluctuations, government support, and the impact of these factors on farmers' livelihoods and well-being. The findings are intended to provide context-specific insights that may assist policymakers, social workers, researchers, and development agencies in designing appropriate interventions for the sustainable development of the duck farming sector. While the study is confined to Alappuzha district and is qualitative in nature, it offers valuable understanding of the lived experiences of duck farmers that can serve as a foundation for future research.

CHAPTER IV

CASE DESCRIPTION

4.1 Introduction

This section presents the detailed case descriptions of the selected participants who were purposively chosen for the study based on their long-term involvement in duck farming in Alappuzha district. The cases include farmers from different locations and backgrounds, representing diverse experiences related to traditional duck farming and its associated livelihood challenges. Each case provides information on the participant's personal and family background, farming practices, socio-economic conditions, and the role of duck farming in sustaining household livelihoods. The descriptions also highlight the major challenges faced by the participants, including recurring floods, avian influenza (H5N1) outbreaks, rising input costs, labour shortages, market fluctuations, debt, and limited institutional support. In addition, the cases explore the emotional and psychological impact of these challenges, as well as the coping and adaptation strategies adopted by farmers and their families. Together, these case descriptions provide an in-depth understanding of the realities of duck farming livelihoods in Alappuzha and form the basis for the thematic analysis presented in the subsequent sections.

4.2 Case Descriptions

Case A

Case A is a 62-year-old traditional duck farmer from Chennithala, Alappuzha district, Kerala. He belongs to a farming community where duck rearing has been practiced for generations as an important livelihood activity. Duck farming has been his primary occupation for more than forty years. Through this work, he has supported his family, educated his children, and maintained his household. For him, duck farming is not just an occupation but a significant part of his life and identity.

He lives with his wife and family. She actively participates in the duck farming activities and plays an important role in managing the hatchery operations. She assists her husband in egg sorting, monitoring incubation, and maintaining cleanliness and hygiene in the hatchery. Their elder son works with his father on the farm, helping with duck feeding, field releases, and other daily farm activities. Their younger son, he, is an engineer who currently works in Australia. Though he is not directly involved in farming, he maintains emotional contact with the family and supports them morally. He has more than forty years of experience in traditional duck farming in the Alappuzha region. *“I have been farming ducks for more than forty years. This work started when I was young, and it has been my only livelihood. Through these ducks, I*

raised my children and managed my family." He started this occupation at a young age and gradually developed his skills in managing ducks, operating a hatchery, and maintaining the farming cycle connected with paddy cultivation. Over the years, he gained practical knowledge of egg incubation, duck health, and seasonal farming patterns in the Kuttanad ecosystem. Through this work, he supported his family and educated his children. Even today, he continues this occupation with the same dedication despite many challenges.

At present, he follows a regular daily routine related to farm management. His day usually begins early in the morning with checking the ducks, feeding them, and collecting eggs. He and his wife manage the hatchery by sorting eggs, monitoring the incubation process, and maintaining hygiene in the hatchery unit. "*Every day, my routine starts early in the morning. First, I check the ducks and collect the eggs. My wife helps me sort the eggs and manage the hatchery. We carefully monitor the incubation process to ensure proper hatching*." Later in the day, with the help of labourers, ducks are taken to nearby paddy fields where they feed naturally on leftover grains and insects. He also supervises workers, manages feed supply, and monitors the ducks' health. In the evening, the ducks are brought back, and the farm is cleaned and prepared for the next day. This routine reflects the continuous care and attention required in traditional duck farming. "*After that, with the help of labourers, we release the ducks into nearby paddy fields. The ducks feed on leftover grains and insects there. In the evening, we bring them back, clean the place, and prepare the farm for the next day*."

He has spent most of his life engaged in duck farming. By selling duck eggs and duck meat and operating a small hatchery unit, he earned a stable income for many years. In earlier times, duck farming was a profitable occupation in the Alappuzha region, especially in the Kuttanad area, where paddy cultivation and duck rearing exist in a mutually beneficial ecological system. Ducks are often released into harvested paddy fields where they feed on leftover grains, insects, and aquatic organisms. This system reduces feeding costs and improves soil fertility for farmers."*This work requires continuous attention and hard work, but I continue because duck farming is not just a job for me, it is my life."*

However, in recent years, he has been facing several challenges that have affected his livelihood and financial stability. One of the most serious problems faced by him and many other duck farmers in the region is the outbreak of avian influenza (H5N1), commonly known as bird flu. During such outbreaks, the government implements strict disease control measures to prevent

the spread of infection. One of these measures is the compulsory culling of birds within a one-kilometre radius of the infected area.

During the recent bird flu outbreaks in several panchayats of Alappuzha district including Ambalapuzha South, Ambalapuzha North, Anary,Veeyapuram, Karuvatta, and Pallipad, Chennithala thousands of domestic birds were culled by the authorities. According to official reports, more than 24,000 birds were destroyed during different phases of the outbreak. Even when the birds appear healthy, farmers are forced to cull them under government protocol.

He described this experience as extremely painful and financially devastating. He said that many of his ducks were healthy and productive, yet he was compelled to destroy them because of the government order. The loss of birds not only removed his current source of income but also affected his future earnings. The compensation provided by the government was much lower than the actual market value of the ducks. According to the compensation scheme, ₹100 was given for birds below two months, ₹200 for birds above two months, and ₹5 per egg. However, the market value of a mature egg-laying duck is around ₹1000.

He expressed his frustration regarding the compensation system. According to him, the amount provided cannot compensate for the long-term loss caused by the destruction of productive ducks. He compared the situation to cutting down a coconut tree just as it begins to bear fruit. *"Culling egg-laying ducks during bird flu is like cutting down a coconut tree when it has started bearing fruit "*. The emotional pain of destroying his own birds after raising them with care for months was also deeply distressing for him.

Another major challenge he faces is the frequent flooding in the Kuttanad region. The Alappuzha district lies in a low-lying area where floods occur regularly during monsoon seasons. Since duck farming is closely connected with wetland ecosystems, the farms and hatcheries are often exposed to waterlogging and flood damage.

He reported that during one severe flood, water entered his hatchery building and damaged the egg incubation machine. This incident resulted in the loss of approximately 80,000 eggs in incubation. The financial loss from this incident was substantial, and there was no insurance coverage available to compensate for it. Such events create severe economic insecurity for farmers like him.

The rising cost of production has also become a major concern, as feed material costs have increased significantly in recent years. Rice, which is a major feed component for ducks, costs

around ₹30 per kilogram. Additional feed is purchased from neighbouring states such as Tamil Nadu and Karnataka, as well as local markets like Kalady. According to Mr. Roy Mathew, the cost of rearing a single duck can reach ₹2000 to ₹3000.

Despite these rising expenses, the price of duck eggs has not increased proportionately. Each egg is usually sold for around ₹17 in the market. Furthermore, the hatching success rate is relatively low. On average, only one duckling successfully hatches from approximately four eggs. This makes the hatchery business financially risky and reduces overall profit margins.

He also mentioned that media coverage during bird flu outbreaks creates panic among consumers. When news channels repeatedly report on bird flu, many people stop buying poultry products, including duck eggs and meat. Even farmers who are not directly affected by the disease suffer financial losses due to reduced market demand.

Labour shortage is another problem affecting duck farming. He employs around five workers to assist with farm activities. These workers include migrant labourers who are paid approximately ₹1000 per day. However, many experienced workers have retired due to old age, and younger people are not interested in entering the duck farming profession. According to him, younger generations see the occupation as risky and uncertain.

He also faces financial pressure due to loans and debts. At present, he has a debt burden of around ₹8 to ₹10 lakhs. Because formal institutional credit is difficult for small duck farmers to obtain, he has often relied on private lenders for financial support. These loans usually come with high interest rates, which increase the financial burden on the farmer.

He also expressed concern about the lack of livestock insurance schemes specifically designed for duck farmers. According to him, if adequate insurance coverage were available, farmers would feel more secure and better protected against unexpected losses from disease outbreaks or natural disasters.

Another issue he raised was the inconsistent availability of vaccines and veterinary support. In earlier times, vaccines were regularly supplied through veterinary hospitals, but recently the supply has become inconsistent. Farmer unions that previously supported duck farmers are also less active now, reducing their ability to collectively demand better policies and government support.

Despite all these challenges, he continues his farming activities with determination and resilience. Duck farming has been central to his life for more than four decades. He strongly

believes it is not just a job but a way of life he inherited and developed over the years of hard work.

He also expressed deep emotional attachment to his ducks and farming practices. He said that he raised his children on the income from these ducks, and therefore, the occupation holds emotional value for him. His commitment to continue farming even during difficult times reflects his strong sense of responsibility toward his family and livelihood.

Although the occupation has become increasingly difficult due to disease outbreaks, floods, market instability, and rising production costs, he hopes that better government support, improved compensation policies, and access to insurance schemes can help farmers sustain their livelihoods in the future.

Overall, his life story reflects the struggles faced by traditional duck farmers in Kerala. It highlights the importance of sustainable agricultural systems, effective government policies, and institutional support to protect small-scale farmers from economic and environmental risks.

During the interaction with Case A, it was observed that duck farming is not only his occupation but also an important part of his life and identity. He has been engaged in this work for more than forty years and has developed strong experience and knowledge about traditional duck rearing practices in the Kuttanad region. His farm activities mainly include hatchery management, duck rearing, and releasing ducks into paddy fields after harvest. The hatchery unit plays a central role in his livelihood, where eggs are carefully sorted, incubated, and monitored for hatching. His wife actively participates in these hatchery activities, especially in maintaining hygiene, sorting eggs, and checking incubation conditions.

The farming system followed by his closely connected with the paddy field ecosystem. After the paddy harvest, ducks are released into the flooded paddy fields where they feed on leftover grains, insects, and small aquatic organisms. This system helps reduce feed costs and supports a natural farming cycle. However, the hatchery and farm infrastructure appear vulnerable to environmental challenges such as floods and waterlogging, which are common in the low-lying areas of Kuttanad.

He also employs several labourers who assist in feeding ducks, cleaning the farm area, managing egg collection, and releasing the ducks into the fields. Some of these workers are migrant labourers. It was observed that the cost of labour has increased, and experienced workers are becoming fewer. Despite financial pressures, he continues to manage his farm with

the help of family members and workers. His strong emotional attachment to his ducks and farming activities was clearly visible during the interaction.

From this case, researcher understood that duck farming in Alappuzha is a traditional livelihood system that depends on the close relationship between hatchery operations, duck rearing, labour support, and the paddy field ecosystem. The hatchery is a crucial part of the farming process because it determines duckling production and the continuity of the farming cycle. Proper egg incubation, monitoring, and hygiene practices are essential for successful hatching.

The case also shows that duck farming is a labour-intensive occupation that requires the support of family members and hired workers. Labourers play an important role in managing daily farm activities, such as feeding ducks, maintaining cleanliness, and moving ducks to paddy fields. However, labour shortages and increasing wages are creating additional challenges for farmers.

Another important aspect researcher understood is the ecological connection between duck farming and paddy cultivation. Ducks feeding in paddy fields after harvest create a sustainable system that benefits both farmers and the environment. At the same time, the farming system is highly vulnerable to environmental risks such as floods, diseases, and market instability.

Overall, this case helped me understand that traditional farming systems, such as duck rearing, require strong institutional support, financial protection, and improved infrastructure to sustain the livelihoods of farmers like those in case A.

Case B

Case B is a 60-year-old traditional duck farmer residing in Anary, a rural area in Alappuzha district of Kerala. This region is widely known for its backwaters, paddy cultivation, and low-lying terrain, which make it highly vulnerable to seasonal flooding. The land remains waterlogged for extended periods during the monsoon season due to heavy rainfall, poor drainage, and overflow from nearby rivers and canals. These environmental conditions directly affect the livelihoods of people in this region, especially those who depend on agriculture and allied activities.

For farmers like Case B, flooding is not an occasional event but a recurring and unavoidable challenge. During flood seasons, the entire farming system is disrupted. Ducks are often exposed to contaminated water, increasing the risk of disease outbreaks. In many cases, ducks are washed away by strong currents, resulting in immediate financial loss. The lack of adequate shelter during floods further worsens the situation, leaving the ducks unprotected from harsh

environmental conditions. These repeated losses create both economic and emotional stress for farmers.

In addition to direct losses, floods also damage infrastructure such as sheds, feeding areas, and storage spaces. Access to feed materials becomes difficult, and transportation is often disrupted. Farmers struggle to maintain their livelihood during and after such disasters. Recovery takes time, and in many cases, they are forced to depend on loans or external support.

Duck farming is a traditional occupation in this region and has been practised for generations. It is closely linked to the community's cultural identity. Case B belongs to such a background where duck farming is not just a means of earning income but also a part of their way of life. He has been involved in this occupation for more than forty-five years, continuing the work his father started.

His entry into duck farming was not based on personal choice but was influenced by family circumstances. At a young age, he had to take up responsibilities due to his father's illness. Recalling this situation, he said, *"When I was in 10th standard, my father became sick, so I had to stop studying and continue this work."* This statement reflects the sacrifices he made at an early stage of life and how it shaped his future.

He lives in a nuclear family consisting of his wife, son, and daughter-in-law. His daughter is married and settled in Nedumudi, which is a nearby area. His family plays an important role in supporting his livelihood. His wife primarily manages household responsibilities but also assists him with farming activities when needed, especially during busy periods or times of crisis.

His son actively participates in the daily activities of duck farming. He helps feed the ducks, clean the surroundings, maintain hygiene, and monitor the flock's health. This shows that duck farming is not an individual effort but a collective family activity. The cooperation among family members is essential for managing such a labour-intensive occupation.

However, there is a visible shift in the younger generation's aspirations. His daughter-in-law is pursuing higher education, indicating a change in career preferences. Unlike previous generations, younger people are seeking more stable and less physically demanding jobs. This shift reflects broader social changes and raises concerns about the future continuation of traditional occupations like duck farming.

Over the year, he has developed extensive experiential knowledge in duck farming. His understanding is not based on formal education or technical training but on years of observation, practice, and adaptation. He is well aware of ducks' feeding habits, breeding cycles, and the early signs of disease. This practical knowledge helps him manage his farm effectively under challenging conditions.

Currently, he manages around 1200 ducks, which requires continuous attention and care. His daily routine begins early in the morning and continues throughout the day. He prepares feed, guides the ducks to suitable bodies of water, and ensures their safety from predators and disease. This type of work does not follow fixed working hours and demands constant involvement, making it physically and mentally exhausting.

One of the most serious challenges he faces is the frequent occurrence of disease among ducks. Over the years, he has witnessed significant changes in disease patterns. In earlier times, there were limited medical facilities, and farmers had very few options to treat diseases. Sharing his past experiences, he said*, "During my younger days, there was no medicine for plague."* This highlights the difficulties farmers face in managing livestock diseases without adequate support.

Although veterinary services and medicines have improved in recent years, new diseases such as avian influenza (bird flu) have emerged, creating new challenges. These diseases spread rapidly and cause sudden death among ducks, leading to heavy losses. Explaining the current situation, he said*, "Now if disease comes, the duck just falls and dies,"* he said. This statement reflects the severity and unpredictability of modern diseases.

Disease outbreaks not only affect the health of the ducks but also create fear and uncertainty among farmers. Preventive measures are often insufficient, and once an outbreak occurs, it spreads quickly. Farmers have very little control over such situations, making duck farming a highly risky occupation. Environmental factors play a crucial role in influencing duck farming.

Overall, Case B illustrates the long-term challenges experienced by a traditional duck farmer whose livelihood is closely dependent on the wetland ecosystem of Alappuzha. The case highlights the combined impact of recurring floods, disease outbreaks, labour-intensive farming, and changing socio-economic conditions on the sustainability of duck farming. Despite these difficulties, the farmer continues the occupation by relying on family support, traditional knowledge, and practical experience. The case emphasizes the need for improved

disease prevention, flood mitigation measures, institutional support, and livelihood protection to ensure the long-term sustainability of traditional duck farming in the region.

CASE C

Case C, aged 55, is a pre-degree graduate residing in Veeyapuram, Alappuzha district, Kerala. She is married to a farmer and has two children: a daughter who has completed her M.com and a son who works abroad in Jordan. Duck farming, along with vegetable cultivation, has been her family's traditional livelihood for generations. Her father was a conventional duck farmer, and she inherited the responsibility of continuing the family farming occupation. For her, duck farming is not merely an economic activity; it is deeply tied to her identity, family history, and way of life. She described her connection with farming*: "Duck, paddy, and vegetable cultivation have always been my way of life. My father was a traditional duck farmer."* Her involvement in farming began as part of her family's expectations and responsibilities, and she humorously recalled: *"Once a day starts, my daughter… life… (laughs). What are you asking? Have you made anything? We make it from the duck region and the agricultural region."* This statement reflects both her deep attachment to farming and the sense of continuity she maintains with her family tradition.

She manages around 5,000 ducks, including char and chempalli varieties, alongside vegetable cultivation. She provided detailed insight into the costs, feed, and procedures involved in her occupation: *"When buying a duckling from the hatchery now, it costs 25 rupees. Previously, rice, starter feed, finisher feed, fish powder, and dried nandan were brought from the coastal area at 130 rupees per kilogram. Only if all of this is provided will it grow well." The cost of vaccination, which was previously free, is now limited due to shortages, and she explained: "Vaccines are provided free by the government, but currently, there is a shortage. Right now, we have about 5,000 ducks, chara and chempalli varieties. Kuttanadan ducks are now branded and approved by the central government."* She highlighted the importance of proper and timely feeding*: "If we feed properly for 30 days, only then is there any profit. Often, ducks are released to the farm only after 60 days. Everyone here knows this is the livelihood. We learned it traditionally. We do not know any other occupation."* Her statements reflect the painstaking care, precise timing, and continuous labour required in duck farming, which demands consistent attention and physical effort.

Case C discussed the uncertainties and risks associated with duck farming: "If no disease comes, there is profit. But if bird flu occurs, it is normal for two or four ducks to die at a time."

The vulnerability of the farm to environmental conditions and disease outbreaks is acute, and she recounted past experiences with floods and losses: *"Last time, our ducks did not have bird flu, but due to the situation in the area, more than 7,000 ducks had to be culled. We were given 200 rupees per adult duck and 100 rupees per chick. But the market price of one duck is 430 rupees. How adequate is this compensation?"* She highlighted the economic pressures, noting that "A labourer's daily wage is 1,000 rupees." This shows that managing the farm involves not only physical labour but also financial planning and human resource management. She expressed concern for her children's future*: "I am not ready to let my children work in this area. The hardship we face should not be theirs. That is why they have gone outside."* This statement emphasizes both her awareness of the risks of traditional farming and her responsibility toward safeguarding the next generation.

She highlighted the connection between duck farming and other agricultural and ecological systems*: "The effort of raising ducks benefits the fish. That's why the fish resources grow."* She described the severe impact of extreme events, such as floods*: "In the 2018 flood, we had 500 ducks. Many of them were washed away. No support came from the government. This is a region with no loans, subsidies, or insurance." Despite repeated government promises, practical support is minimal: "The government promises loans, insurance, and other assistance every time.* But practically, nothing is provided." Earlier attempts to form collective farmer groups also failed due to a lack of tangible benefit: "Previously, groups of 8–10 farmers came together, but as there was no benefit, they disbanded." Her statements reveal how systemic gaps and a lack of institutional follow-through exacerbate vulnerability in traditional occupations.

Bird diseases pose recurring challenges that can devastate a farm financially and emotionally. She explained: *"If bird flu comes, eggs and meat cannot be sold. It leads to significant financial loss. Then the animal protection department comes, culls the ducks, and burns them."* The emotional toll of losing ducks, which are central to livelihood and family identity, is profound: *"The ducks we raise are not just our livelihood; they are part of our life. Losing them hurts our souls."* Compensation for losses is slow and inadequate*: "For one duck, only 200 rupees was received as compensation, and that too after 10 months. Until then, we had to borrow at interest."* These experiences highlight the precarious nature of duck farming and the insufficient safety nets available.

Due to limited formal education and lack of alternative skills, she continues in duck farming: *"Since we do not know any other occupation, this is what we continue. Previously, we also had*

cows, but they were lost to disease. No government support was received. That's why the area was abandoned." She acknowledged the challenges faced by the younger generation*: "Now I have to tell my children not to pursue this work. The hardship is extreme. Without government protection, this sector cannot continue."* Rising feed costs and inadequate veterinary services compound these difficulties: *"Today, the cost of feed is very high. Starter feed has reached up to 2,150 rupees per kilogram. Only if proper nutrition is given will the ducks grow."* She also emphasized that support systems are not functioning as intended*: "Even from the veterinary hospital, timely information and support are not received. There is a delay in vaccine supply. When bird flu occurred, they said a lab would be set up in Alappuzha, but nothing has happened. To confirm the disease, we have to send samples elsewhere."* She underlined the potential benefits of insurance: *"If insurance is available in this area, it will be a great help. If vaccines are available on time, diseases can be controlled in advance."*

Currently, farmers are not permitted to release ducks freely into paddy fields: "People are not allowing ducks to be released in the fields." Traditional practices are increasingly disregarded: *"The Bible says after harvesting, do not look back; it is for the birds. But now, it is not being followed. Fields are burned; ducks are not allowed."* The recurring nature of bird flu and the effect of large-scale farming were highlighted*: "Bird flu comes repeatedly. Small-scale duck farmers are collapsing. Large-scale farming leads to disease spread."* Maintaining hygiene and clean water is essential*: "If raised in clean water and hygiene is maintained, disease can be reduced. If ducks sit in wet soil, it turns into ammonia."* She also pointed out the high quality of farm produce*: "Our eggs are high quality. People book them in advance." Traditional feeding practices were employed in the past: "Earlier, cashew, coconut, and wheat rice were given to ducks."* She concluded by stressing the importance of timely support: *"If insurance and vaccines are provided on time by the government, diseases like bird flu can be controlled. Only with real support from authorities can this area survive."*

Case C is a highly skilled and dedicated farmer who continues her work despite repeated losses, health risks, and inadequate institutional support. Her physical labour is intensive, given the waterlogged, muddy fields, and she demonstrates resilience in the face of environmental and economic uncertainties. Generational changes are apparent as younger family members pursue education and jobs outside farming. Emotional stress, financial instability, environmental vulnerability, and lack of effective government assistance make duck farming a demanding and high-risk occupation.

From this case, it is understood that duck farming in Kuttanad is highly sensitive to environmental, social, and economic challenges. Farmers rely on practical experience rather than formal training. Financial insecurity, floods, rising feed costs, recurring bird flu, and weak institutional support threaten the sustainability of traditional livelihoods. Younger generations are moving away from farming, raising concerns about the continuation of these practices. Timely compensation, insurance, proactive government measures, and proper veterinary support are critical for sustaining duck farming in this region. This case provides a detailed insight into the struggles, resilience,and lived experiences of a rural duck farmer navigating complex environmental, economic, and social challenges.

Case -D

Case D is a 69-year-old duck farmer from Mannar, Alappuzha district, who has completed SSLC education. He lives with his wife, one son, and one daughter. At present, he rears around 150 ducks.

He learned duck farming from his father and continued in the occupation due to his deep affection for ducks. The ducks are reared near his house. The paddy fields are located about eight kilometers away. A nearby canal provides a good source of clean water, which helps maintain the health of the ducks. According to him, duck farming does not require heavy investment, as feed costs are relatively low and the ducks also generate income through egg production.

During the paddy cultivation season, the ducks are kept confined for approximately fifteen days to prevent damage to the crops. Once harvesting is completed, they are released back into the fields. In addition to duck farming, he also runs a welding workshop, which serves as another source of livelihood. He has been involved in duck farming for more than thirty-five years.

In earlier years, he used to take his ducks to different places such as Tamil Nadu, Karnataka, Tirunelveli, and Palakkad for farming activities. At one point, he owned more than 14,000 ducks, but the number has now been reduced to around 150, making management easier.

Bird flu has been one of the greatest challenges he has faced. During the years 1983–1984, he lost nearly 10,000 ducks due to bird flu. At that time, ducks were transported in three to four truckloads to different locations. Some ducks were sold for meat, while others were used for egg production.

He recalls that duck farming was once widespread in many local areas. Many friends and fellow farmers were engaged in the occupation, but most of them have now left the sector. Duck farming helped him educate his children and support his family. However, income from the occupation has declined significantly in recent years. Climate change and rising temperatures have also become major concerns, as excessive heat can lead to duck mortality.

Apart from farming, he worked in Mangalore for nearly thirty years after receiving training in welding. He continues to operate his workshop even today. Floods have not caused major losses to his farm because the duck sheds are built on elevated platforms. During periods of flooding, the ducks are moved to safer locations. He also constructed iron platforms to protect the ducks during severe floods.

The feed is prepared at home, and vaccinations are provided through veterinary services. However, he has never received insurance benefits, subsidies, or support from farmer organizations. Recently, he underwent surgery for a blocked blood vessel in his leg, which cost approximately three to four lakh rupees. As a result, walking has become difficult, and his wife now takes a more active role in caring for the ducks.

He notes that duck farming has supported not only his family but also the livelihoods of several other families. Nevertheless, many farmers have abandoned the occupation due to debt, disease outbreaks, and declining profitability. He believes that effective treatment for bird flu is still unavailable. According to him, one of the major reasons for disease outbreaks is the improper disposal of infected ducks. He also mentions that using protective nets helps reduce disturbances from dogs, foxes, and other predators.

He has actively participated in protests and demonstrations organized by duck farmers and has submitted complaints to authorities. However, he feels that these efforts have yielded little practical benefit. He strongly believes that maintaining clean water sources and proper hygiene is essential for preventing disease. He regularly uses disinfectants to keep the surroundings clean. In his view, duck farming can once again become a profitable occupation if better disease control measures and scientific treatment options are developed.

“Just as applying Vicks when we have a headache gives temporary relief, medicines given to ducks only provide temporary improvement. The symptoms may reduce, but the disease does not completely disappear and often returns again. Until now, no medicine has been discovered that can completely cure this disease.”

Overall, Case D demonstrates the experiences of an elderly traditional duck farmer who has remained committed to duck farming despite decades of environmental, economic, and health-related challenges. His case highlights the importance of traditional knowledge, family support, and adaptive practices such as elevated duck sheds and maintaining hygiene in sustaining the livelihood. It also reveals the limitations of existing institutional support, including the lack of insurance, subsidies, and effective disease control measures. The case reflects the resilience of experienced duck farmers while emphasizing the need for improved veterinary services, scientific disease management, and stronger government support to ensure the long-term sustainability of duck farming in Alappuzha.

Case - E

Case E is a small-scale duck farmer from Karuvatta, Alappuzha, who has been engaged in duck farming for the past five years. She entered the field out of her personal interest and began with a small number of ducks at her home. Currently, she raises 25 ducks primarily for egg production. She considers duck farming not only a supplementary source of income but also an opportunity to gain practical knowledge and experience in agriculture and livestock management. Through her daily involvement in duck rearing, she has developed a strong sense of responsibility, patience, and dedication.

Her daily routine consists of feeding the ducks, providing clean drinking water, monitoring their health, cleaning the farming area, and collecting eggs. Family members occasionally assist her with these activities. Although the scale of her farming operation is relatively small, she faces several challenges, including rising feed costs, disease risks, and unpredictable weather. The rising cost of feed and veterinary medicines has affected the profitability of duck farming and made it more difficult to sustain. Nevertheless, she has not taken out loans and manages the farm with her family's support. The income generated from duck farming contributes to household expenses, while additional family income sources provide financial stability.

Environmental conditions significantly influence her farming activities. She resides in an area prone to seasonal flooding and heavy monsoon rainfall. During periods of heavy rain, waterlogging and flooding can disrupt daily farming activities, damage shelters, and affect feed storage facilities. She has observed noticeable changes in weather patterns and believes that climate change has increased the unpredictability of farming conditions. To minimize environmental risks, she ensures proper shelter management, maintains cleanliness, and takes precautionary measures before the monsoon season.

Although she has not directly experienced a major bird flu outbreak on her farm, she remains aware of the risks of infectious diseases and follows preventive measures to protect her ducks. According to her, a few ducks have died due to illnesses and sudden health complications. She believes that contaminated water sources, poor sanitation, extreme weather conditions, and disease outbreaks are among the major causes of duck mortality. Floods and prolonged rainfall can weaken ducks and increase their vulnerability to infections and health problems. Therefore, she emphasizes the importance of maintaining a clean environment, providing safe drinking water, ensuring proper shelter, and regularly monitoring duck health to prevent losses. She also receives guidance from veterinary officials and appreciates the awareness programmes conducted by the Animal Husbandry Department. However, she believes that duck farmers require greater financial assistance, improved disease-control programmes, and more training opportunities.

To cope with challenges, she focuses on maintaining hygiene, improving shelter conditions, and closely monitoring her ducks' health. She also relies on personal experience, local knowledge, and family support to manage risks effectively. Women play a vital role in farming activities, particularly in feeding ducks, cleaning the farm premises, and collecting eggs. During periods of crisis, their contribution becomes even more significant. She notes that financial difficulties can affect the entire household, including children's well-being and quality of life, making shared family responsibilities essential.

Like many small-scale farmers, she experiences stress and uncertainty regarding the future of farming. Rising production costs, disease threats, and changing climatic conditions often create emotional and financial pressure. However, support from family members, neighbours, and the community helps her remain motivated and continue farming despite these challenges. She views duck farming as a meaningful livelihood activity that contributes to household income while fostering resilience, responsibility, and personal growth. She hopes that enhanced government support, financial assistance, farmer training programmes, and effective disease-management systems will strengthen the livelihoods of duck farmers and ensure the long-term sustainability of the sector.

"I started duck farming with a small number of ducks at my home because of my own interest. It provides some extra income and has helped me learn more about farming. Every day I feed the ducks, provide clean water, check their health, and collect eggs. Rising feed costs, changing weather conditions, and the risk of diseases are the biggest challenges I face. Heavy rains and

floods can affect shelters and farming activities. Some ducks have died due to illness, and a few deaths have occurred because of sudden health problems. We have not experienced bird flu on a large scale, but minor diseases occur from time to time. Therefore, when signs of illness appear, treatment and preventive measures should be taken immediately to control the disease and prevent further losses. Family support helps me continue farming despite difficulties. I believe that more financial assistance, better disease-control programmes, and training opportunities would greatly help duck farmers like me."

Overall, Case E demonstrates that small-scale duck farming serves as an important supplementary livelihood despite its limited scale. The case highlights the farmer's commitment, family support, and adoption of preventive farming practices to manage challenges such as rising feed costs, climate variability, and disease risks. It also emphasizes the need for improved financial assistance, regular training programmes, effective disease-control measures, and stronger institutional support to enhance the sustainability of small-scale duck farming.

CASE F

Case F is a 52-year-old duck farmer from Melppadam, Alappuzha who has been engaged in duck farming for more than twenty-five years. She belongs to a family with a long tradition of duck farming, having inherited the occupation from her parents and grandparents. She primarily rears ducks for meat production and follows a seasonal farming pattern, focusing mainly during harvest seasons and festive periods such as Christmas when market demand is high. She raises ducks in two production cycles and supplies them to markets in Kerala and Tamil Nadu. The main duck varieties she rears are Kuttanadan Duck, Chara, and Chambally. To ensure proper growth, she provides a nutritious diet consisting of rice, fish, prawns, shellfish, and other locally available feed resources. However, the rising cost of feed has become a major challenge, with a bag costing approximately ₹400.

Throughout her farming career, she has faced numerous challenges related to disease outbreaks, particularly plague and a disease locally referred to as "Parsal." According to her, the lack of timely availability of vaccines and medicines is one of the most serious issues affecting duck farmers. She believes that preventive vaccination before the onset of disease can significantly reduce mortality. At one point, she maintained nearly 10,000 ducks, but repeated disease outbreaks and financial losses drastically reduced the scale of her farming operation. She reported suffering losses exceeding ₹18 lakh due to disease outbreaks, while receiving only

₹5,000 as compensation. Despite these severe losses, she has not received any significant government assistance or welfare benefits. Currently, she is burdened with debts exceeding ₹20 lakh.

She explained that repeated disease outbreaks have created long-term financial and emotional stress. The burden of debt continues to accumulate, making recovery increasingly difficult. She noted that many farmers submit complaints after experiencing losses, yet compensation often fails to reach those most affected. Apart from duck farming, she had previously engaged in crop cultivation, but recurring losses forced her to discontinue agricultural activities. Disease outbreaks, including bird flu, have caused the death of many ducks over the years. She observed that if disease symptoms are identified early and appropriate preventive measures are taken, some losses can be avoided.

She pointed out that disease incidence is particularly high during December and other periods characterized by stagnant water. Water pollution and inadequate water flow contribute significantly to the spread of disease. She also believes that sudden climatic changes, including extreme heat followed by heavy rainfall, are major factors responsible for disease outbreaks and mortality among ducks. During June and July, many ducks have died due to illness associated with these changing environmental conditions.

Floods have also affected her farming activities. Prior to major flood events, she often relocated ducks to other districts to protect them from anticipated losses. Through years of experience, she has developed the ability to identify signs of illness in ducks at an early stage. Although she has often considered leaving the occupation due to financial difficulties, she continues because duck farming is the only livelihood she knows and because of her deep passion for the profession.

She noted that duck farmers once had active unions and collective organizations, but participation has declined over time. Since farmers spend most of their time in paddy fields caring for ducks and protecting them from threats such as wild cats and other predators, they have little opportunity to participate in meetings or collective activities. She believes that government subsidies for feed would provide meaningful support to farmers struggling with rising production costs.

Despite years of hardship, debt, and uncertainty, she has adapted to the challenges of duck farming. Her traditional knowledge, inherited through generations, helps her identify disease symptoms, estimate the age and condition of ducks, and make management decisions. She

explained that many experienced duck farmers have abandoned the occupation because of mounting debts, disease outbreaks, and declining profitability. Even her relatives and acquaintances who were once involved in duck farming have gradually withdrawn from the sector. Although she sometimes thinks about retiring from farming, her passion for duck rearing keeps her committed to the occupation. She stated that she will continue farming for as long as she is physically able, driven by her lifelong attachment to ducks and the farming way of life.

"Duck farming is the work I inherited from my parents and grandparents. At one time, I had nearly 10,000 ducks, but repeated disease outbreaks caused heavy losses. We lost more than ₹18 lakh yet received only ₹5,000 as compensation. The biggest problem is not only the disease but also the lack of vaccines and medicines at the right time. Climate change, stagnant water, and sudden weather changes make diseases spread quickly. Many farmers have stopped farming because of debt and losses. I have often thought about stopping, too, but I cannot leave this occupation because I love duck farming. As long as I am able to continue, I will keep raising ducks despite all the challenges."

Overall, Case F reflects the severe economic, environmental, and institutional challenges faced by large-scale duck farmers. Repeated disease outbreaks, inadequate compensation, mounting debts, and rising production costs have significantly affected the farmer's livelihood. Despite these hardships, her extensive farming experience, traditional knowledge, and strong emotional attachment to duck farming demonstrate remarkable resilience. The case highlights the urgent need for timely vaccination, adequate compensation, feed subsidies, and comprehensive government support to sustain large-scale duck farming.

Case -G

Case G is a young duck farmer from Pallipad, Alappuzha district, who completed a Fire and Safety course and previously worked abroad. However, due to the COVID-19 pandemic, he was compelled to return to his native place and subsequently resumed duck farming, a traditional occupation practised by his family for generations. His decision to continue in the agricultural sector was driven by both personal interest and a strong attachment to his family's farming heritage. Although he remains committed to the profession, he is increasingly considering seeking employment abroad again because of the growing challenges associated with duck farming.

According to him, recurrent disease outbreaks, frequent flooding, rising production costs, and inadequate institutional support have made duck farming increasingly difficult to sustain. He

explained that duck farming is the primary occupation he knows well, having learned it through family experience and traditional knowledge passed down through generations. While he has occasionally engaged in other agricultural activities, he lacks extensive knowledge of alternative occupations and therefore continues to rely on duck farming as his primary livelihood.

Environmental challenges have become a major concern in recent years. He reported that floods and heavy rainfall frequently disrupt farming activities, forcing farmers to relocate ducks to safer locations during severe flooding events. Climate-related challenges have increased production risks and contributed to higher mortality rates among ducks. He also observed that younger generations are generally reluctant to enter the sector because they perceive it as financially unstable and highly vulnerable to environmental and disease-related risks.

He identified rising production costs as one of the most significant problems affecting duck farmers. In particular, rising fuel prices have increased transportation costs and contributed to higher overall farming costs. The prices of feed, medicines, and other essential inputs have also risen considerably, placing additional financial pressure on farmers. These escalating expenses have reduced profit margins and made it increasingly difficult to maintain farming operations. Despite investing substantial resources, farmers often receive limited financial returns.

Disease outbreaks, particularly bird flu and other infectious diseases, continue to pose serious threats to the sustainability of duck farming. According to him, repeated disease outbreaks have resulted in significant financial losses and growing indebtedness among farmers. Although farmer unions and associations exist and maintain contact with government agencies regarding medicines, vaccinations, and farmer welfare, he believes that the benefits reaching farmers remain inadequate. He expressed dissatisfaction with the limited compensation provided following disease outbreaks and noted that many farmers continue to struggle despite repeated appeals for assistance.

He expressed optimism regarding the possibility of improved government support in the future. He hopes that the current government will introduce more effective subsidies, welfare measures, compensation schemes, and protective policies specifically designed for duck farmers. In his view, stronger institutional support is essential to ensure the sector's sustainability and to encourage younger generations to participate in duck farming.

Despite numerous challenges, including debt, disease outbreaks, environmental hazards, and economic uncertainty, he remains emotionally attached to duck farming. However, the

continuous hardships have led him to question whether he can continue in the occupation over the long term. Like many other farmers in the region, he is increasingly considering alternative employment opportunities while hoping for meaningful interventions that can improve the future of duck farming.

"I studied Fire and Safety and worked abroad, but when COVID came, I had to return home. Since duck farming is the occupation practiced by my family, I continued it. But the challenges are increasing every day."

Overall, Case G illustrates the experiences of a young duck farmer striving to continue a traditional family occupation amid increasing uncertainty. The case highlights how recurrent floods, disease outbreaks, rising production costs, and limited institutional support influence the aspirations of younger farmers. Although he remains committed to duck farming, concerns about its long-term viability have led him to consider alternative employment opportunities. The case underscores the importance of youth-focused policies, improved financial support, and sustainable farming initiatives to encourage the younger generation to remain engaged in duck farming.

CHAPTER - V

THEMATIC ANALYSIS AND DISCUSSIONS

5.1 Introduction

Thematic analysis of the data collected from traditional duck farmers in Alappuzha district reveals the complex interplay between livelihood practices, environmental conditions, and institutional support systems. The narratives of Cases A to F, along with supporting literature, highlight that duck farming is not merely an economic activity, but a way of life deeply embedded in the socio-cultural and ecological context of Kuttanad. The analysis aims to identify recurring patterns and key issues shaping the experiences of duck farmers, particularly regarding financial insecurity, climate vulnerabilities, disease risks, and changing labour dynamics. By organizing the findings into distinct themes, this section seeks to provide a structured understanding of both the challenges faced by farmers and the resilience they demonstrate in sustaining this traditional occupation**.**

Across the nine themes that emerged, the study captures both the material and non-material dimensions of duck farming livelihoods. The themes address socioeconomic pressures, environmental instability, health risks, and gaps in government support, while also highlighting the role of family, gender, and emotional attachment in continuing the practice. The analysis further highlights the need for scientific interventions, extension services, and policy reforms to ensure the long-term sustainability of duck farming. Overall, the thematic analysis provides insight into how traditional knowledge and lived experiences intersect with external risks and why strengthening institutional mechanisms is critical to safeguarding the livelihoods of duck-farming communities in Alappuzha**.**

In summary, thematic analysis is a flexible, systematic, and rigorous method for making sense of qualitative data. It allows researchers to move beyond surface descriptions and develop an in-depth understanding of participants' experiences, perceptions, and the patterns that shape them.

5.2 Profile of the respondents

Case A:

Case A is a 62-year-old male from Chennithala, Alappuzha. He is married and lives in a nuclear family. He has completed his education up to high school level. He belongs to a traditional farming community where duck rearing has been a generational livelihood. For him, duck farming is more than just an occupation; it is part of his family heritage and identity passed down over decades.

The key environmental feature of his area is its low-lying, flood-prone paddy fields. He practices integrated duck–paddy farming, where ducks are released into harvested fields to feed on leftover grains. However, this ecosystem is highly vulnerable to avian influenza outbreaks, which frequently lead to large-scale mortality and economic losses.

In terms of occupational status, Case A works as a large-scale duck farmer with his own hatchery. He has been engaged in duck farming for 40 years and manages 1500-2000 ducks along with hatchery operations. With four decades of experience, he relies on traditional knowledge combined with practical skills in breeding, incubation, and farm management to sustain his livelihood despite repeated environmental and market challenges.

Case B

He comes from a rural farming family in a flood-prone area and entered duck farming at a young age due to his father's illness. For him, taking up farming was both a family responsibility and the only viable livelihood option available at the time.

The key environmental feature of his area is the backwater region with seasonal flooding, waterlogging, and wetland-based duck farming. The land remains submerged for several months in a year, making farming highly dependent on seasonal cycles. Ducks are reared in these wetlands, feeding on natural resources, but the frequent floods and water contamination pose major challenges to productivity and bird health.

In terms of occupational status, Case B is a large-scale traditional duck farmer. He has been engaged in duck farming for 45 years and manages a large flock. Over the decades, he has developed strong traditional knowledge of managing ducks in wetland conditions, coping with floods, and minimising disease outbreaks.

Overall, Case B represents experienced farmers in Alappuzha’s backwater belt who continue large-scale duck rearing despite recurring environmental risks, relying on inherited knowledge and adaptation to flood-prone conditions.

Case C

Case C is a 55-year-old female from Veeyapuram, Alappuzha. She is married and lives in a nuclear family. Her educational qualification is Plus Two / Higher Secondary.

She belongs to a generational farming family and inherited duck farming from her father. For her, duck rearing is both a traditional livelihood and a continuation of her family's occupation. Along with farming, she also manages household responsibilities.

The key environmental feature of her area is the wetland ecosystem with paddy cultivation. She practices traditional duck farming integrated with paddy fields, where ducks graze after harvest. However, the region faces recurring flood risk, which often damages crops, disrupts farming cycles, and increases vulnerability to diseases.

In terms of occupational status, Case C is a large-scale traditional duck farmer. She has 40 years of experience in duck rearing and currently manages a large flock. Over the years she has gained deep practical knowledge of seasonal farming, duck health management, and marketing of eggs and ducks in local markets.

Overall, Case C represents women farmers in Kuttanad who have sustained large-scale duck farming across generations, balancing traditional practices with the challenges of floods and wetland-based agriculture.

Case D

Case D is a 69-year-old male from Mannar, Alappuzha. He is married and lives in a nuclear family His educational qualification is High School level.

He comes from a traditional farming family and inherited duck farming from his father. For him, duck rearing has been a lifelong occupation and part of the family's generational livelihood in the paddy tracts of Kuttanad.

The key environmental feature of his area is an agricultural landscape with paddy fields and canals. His farming largely depends on natural grazing areas for ducks in harvested fields and along canal banks. The region experiences 'seasonal flooding', which affects feed availability and movement of ducks, making production cycles highly dependent on weather and water levels.

In terms of occupational status, Case D is a small-scale traditional duck farmer. He has been engaged in duck farming for 50 years and currently maintains a small flock. With five decades of experience, he relies on traditional knowledge of grazing patterns, seasonal timing, and low-input rearing methods to sustain his livelihood.

Overall, Case D represents elderly small-scale farmers in Alappuzha who continue traditional duck rearing on a limited scale, adapting to seasonal floods and the availability of natural grazing resources.

Case E

Case E is a 45-year-old female from Karuvatta, Alappuzha. She is married and lives in a nuclear family. Her educational qualification is High School level.

She took up duck farming as a small-scale livelihood activity to supplement her family's income. Unlike generational farmers, she entered this occupation more recently as a means of economic security.

The key environmental feature of her area is the flood-prone lowland near Thottappally Spillway. The region consists of wetlands and paddy fields that face seasonal waterlogging and saline intrusion. Farming here is highly risky due to frequent bird flu outbreaks and other environmental risks. The combination of floods, salinity, and disease makes duck rearing in this belt particularly vulnerable and unpredictable.

In terms of occupational status, Case E is a small-scale traditional duck farmer. She has 5 years of experience in duck rearing and maintains a small flock. With relatively less experience, she relies on local knowledge, guidance from other farmers, and adaptive practices to cope with the environmental challenges of her area.

Overall, Case E represents newer, small-scale women farmers in the Thottappally region who practice duck farming as a supplementary livelihood, while facing high exposure to floods, salinity, and disease outbreaks.

Case F

Case F is a 52-year-old female from Melppadam, Alappuzha. She is married and lives in a nuclear family. Her educational qualification is High School level.

She belongs to a generational farming family and has continued the traditional occupation of duck rearing passed down in her family. For her, duck farming is both a livelihood and a cultural practice linked to the local wetland system.

The key environmental feature of her area is its high flood-proneness as a rural paddy-growing region. The fields remain waterlogged for long periods, and the region depends entirely on the wetland ecosystem for duck farming. The area faces recurring monsoon floods that affect feed

availability, bird health, and duck housing. Despite these challenges, traditional grazing and wetland-based rearing are still practised.

In terms of occupational status, Case F is a large-scale traditional duck farmer. She has 25+ years of experience in duck rearing and manages a large flock. Over the years, she has developed strong adaptive strategies to deal with floods, disease pressure, and seasonal variations in grazing.

Overall, Case F represents experienced women farmers in Alappuzha's flood-prone belt who sustain large-scale traditional duck farming despite regular environmental risks, relying on generational knowledge and wetland-based practices.

Case G

Case G is a 29-year-old male from Pallipad, Alappuzha. He is unmarried and lives in a joint family. His educational qualification is UG with a Diploma.

He belongs to a generational farming family and has continued the family tradition of duck rearing. Being younger and educated, he represents the new generation of farmers who combine traditional knowledge with formal education.

The key environmental feature of his area is a low-lying wetland farming region. The region has extensive paddy cultivation and is subject to seasonal floods every year. Duck farming here is practiced in an integrated system with paddy, where ducks graze in harvested fields and wetlands. The dependence on monsoon cycles and flood patterns makes production seasonal and risky.

In terms of occupational status, Case G is a large-scale traditional duck farmer. He has 7 years of experience in duck rearing and manages a large flock. Despite being relatively new to the occupation, he has quickly scaled up operations by applying both inherited practices and new techniques learned through diploma training.

Case G represents young, educated farmers in Alappuzha who are sustaining and expanding large-scale traditional duck farming in wetland ecosystems, balancing generational knowledge with modern inputs.

5.3 Analysis and Discussion

Theme 1: Socioeconomic Challenges and Financial Insecurity

The findings of this study reveal that socioeconomic challenges constitute the most significant obstacle affecting the livelihoods of duck farmers in Alappuzha. Across all the cases, participants consistently described a decline in the profitability and sustainability of duck farming compared to previous decades. Traditionally, duck farming served as a dependable source of income, enabling farming households to meet daily needs, educate their children, build houses, and maintain a reasonable standard of living. However, the participants explained that the economic situation has changed considerably due to rising production costs and declining returns from duck farming.

One of the major issues identified by participants was the ongoing increase in production costs. The prices of commercial feed, veterinary medicines, fuel, transportation, labour wages, and other farming inputs have risen substantially over the years. Despite rising costs, the selling prices of duck eggs and duck meat have remained relatively stable, resulting in lower profit margins. Participants reported that income from duck farming is no longer sufficient to cover production expenses and household needs, making it difficult to sustain farming as the primary livelihood.

The findings further indicate that repeated environmental disasters and disease outbreaks have intensified financial insecurity. Floods and avian influenza outbreaks frequently result in the deaths of ducks, the destruction of shelters, the contamination of feed, and the disruption of production activities. Many participants reported losing hundreds of ducks during bird flu outbreaks and floods, leading to severe economic losses. Although compensation was provided by government agencies following compulsory culling, participants felt the amount was insufficient to cover the ducks' actual market value and the long-term loss of income. Consequently, farmers were forced to rely on loans from cooperative banks, private moneylenders, relatives, and self-help groups to continue farming operations. Continuous borrowing has increased indebtedness and financial stress, making it difficult for farmers to recover from repeated shocks.

Another important finding is that prolonged financial instability has discouraged younger generations from continuing to farm ducks. Participants explained that many young people prefer salaried employment or migrate to urban areas and abroad because they perceive agriculture and livestock farming as risky and economically unstable occupations. This gradual decline in youth participation raises concerns about the future continuity of traditional duck farming in Alappuzha.

These findings support the Sustainable Livelihoods Framework (DFID, 1999), which posits that financial capital is among the most important livelihood assets influencing household well-being and resilience. When financial resources are eroded by repeated shocks, households become increasingly vulnerable and struggle to recover or invest in future livelihood activities. Similarly, Scoones (2015) argues that livelihood sustainability depends on households' ability to manage risks while maintaining adequate economic resources. The findings also agree with Ellis (2000), who observed that repeated livelihood shocks reduce household resilience and increase dependence on debt and alternative income sources.

Previous studies by FAO (2021) and the World Bank (2021) similarly report that rising production costs, fluctuating markets, limited institutional support, and climate-related disasters significantly threaten livestock-based livelihoods. The present study confirms these observations by demonstrating that duck farmers in Alappuzha face multiple and interconnected economic challenges rather than isolated financial problems. Socioeconomic vulnerability is therefore shaped not only by market forces but also by environmental hazards, disease outbreaks, and institutional limitations.

Overall, the findings suggest that improving market access, ensuring fair pricing for duck products, expanding affordable credit facilities, strengthening livestock insurance, providing timely compensation, and reducing input costs through subsidies are essential measures for enhancing the financial resilience and long-term sustainability of duck farming livelihoods in Alappuzha.

Theme 2: Environmental and Climate-Related Vulnerabilities

The findings indicate that environmental and climate-related vulnerabilities significantly influence the livelihoods of duck farmers in Alappuzha. The district's geographical characteristics, particularly the low-lying wetlands of Kuttanad, expose farmers to frequent floods, waterlogging, and changing climatic conditions. Participants consistently described floods as one of the most destructive events affecting duck farming. Floodwaters damage duck shelters, contaminate drinking water sources, destroy stored feed, and often cause the death or displacement of ducks, resulting in considerable economic losses.

Participants also reported noticeable changes in weather patterns over recent years. They observed irregular rainfall, prolonged monsoon seasons, sudden heavy rainfall, increasing temperatures, and unpredictable seasonal variations. These climatic changes have disrupted traditional farming calendars and made it increasingly difficult to manage duck farming using

conventional methods. Several farmers explained that seasonal migration routes, breeding periods, and feeding practices have all been affected by changing environmental conditions.

Another important finding was the relationship between environmental hazards and disease outbreaks. Floodwater contamination, poor sanitation, and stagnant water create favourable conditions for the spread of infectious diseases among ducks. Farmers explained that disease outbreaks often occur after flood events, leading to additional financial losses and increased mortality. Thus, environmental hazards and livestock health problems are closely interconnected, creating multiple layers of vulnerability for farming households.

The findings further reveal that environmental degradation has reduced the availability of natural grazing areas. Traditionally, ducks grazed freely in harvested paddy fields and wetlands where they obtained natural food sources. However, changes in land use, wetland degradation, pollution, and declining paddy cultivation have reduced these opportunities. Consequently, farmers now depend more heavily on commercial feed, increasing production costs and reducing profitability.

These findings strongly support the Sustainable Livelihoods Framework (DFID, 1999), which identifies environmental shocks as part of the vulnerability context affecting livelihood outcomes. They also support Resilience Theory, which emphasises the capacity of individuals and communities to adapt to recurring environmental disturbances while maintaining their livelihoods. The ability of duck farmers to continue farming despite repeated floods demonstrates resilience, but the increasing frequency and intensity of climate-related hazards are placing considerable pressure on this adaptive capacity.

The findings are consistent with studies by Adger (2006), IPCC (2023), MoEFCC (2022), CWRDM (2021), and Tanner et al. (2015), which conclude that climate change has become one of the most significant threats to agricultural and livestock livelihoods. These studies emphasise that climate variability increases production risks, reduces productivity, and weakens rural livelihood security. Similar observations are evident among duck farmers in Alappuzha, where environmental changes have increased both direct and indirect livelihood losses.

Overall, the findings highlight the urgent need for climate-resilient farming practices, improved flood management, wetland conservation, early warning systems, ecosystem restoration, and disaster risk reduction strategies. Such interventions would strengthen farmers' adaptive capacity and improve the long-term sustainability of duck farming in the region.

Theme 3: Disease Outbreaks and Livestock Health Risks

Disease outbreaks, especially avian influenza (H5N1), represent one of the most serious challenges duck farmers faces (WHO, 2022). Participants consistently identified bird flu and other infectious diseases as major risks to their livelihoods. Farmers reported that these outbreaks often lead to sudden and widespread mortality among ducks, resulting in big economic losses (Gupta et al., 2020). In many cases, even healthy birds are culled under government disease-control protocols, which destroys productive assets and future income opportunities (OIE, 2021).

The findings suggest that disease outbreaks cause not only financial losses but also emotional and psychological stress for farmers (Lorenz, 2020). Participants expressed frustration and helplessness when they had to destroy healthy ducks they had raised with much effort and investment (Hirsch, 2018). Concerns were also raised about irregular vaccine availability, delays in veterinary help, and limited access to preventive healthcare (Department of Animal Husbandry, 2023). Farmers emphasized that dirty water, poor sanitation, and climate-related environmental changes often contribute to disease spread (Pandey & Kumar, 2017). Thus, managing disease remains a critical issue that impacts both the economic stability and emotional well-being of duck-farming families (Rutherford, 2019).

Theme 4: Government Support and Institutional Challenges

Participants shared mixed opinions about the support provided by government departments and other institutions. Although compensation is provided during bird flu outbreaks and disease-control measures are implemented, most farmers believe that the assistance is not sufficient to meet their actual needs. The amount of compensation received after compulsory culling was considered much lower than the market value of the ducks and did not compensate for future income losses. Many participants explained that delays in receiving compensation further increased their financial burden, making it difficult to restart farming. As a result, several farmers depended on loans, private borrowing, or personal savings to continue their livelihood.

The absence of a suitable insurance scheme for duck farming was another major concern expressed by participants. Farmers felt that livestock insurance would help reduce the financial risks associated with disease outbreaks, floods, and other unexpected disasters. However, most participants either had no access to insurance or were unaware of available schemes. Without financial protection, even a single disease outbreak or natural disaster could result in severe economic hardship, particularly for small-scale farmers.

Participants also highlighted several challenges related to veterinary and extension services. Many reported that veterinary officers were mainly available during emergencies, while regular health check-ups, vaccination programmes, and technical guidance were limited. Irregular vaccine supply, delays in veterinary assistance, and a lack of training on scientific farming practices reduced farmers' confidence in existing support systems. Because of these limitations, many farmers continued to depend on traditional knowledge and personal experience for managing diseases and daily farm activities.

Difficulties in accessing government schemes also emerged as an important issue. Participants mentioned lengthy administrative procedures, lack of awareness about available programmes, and weak coordination among different government departments. Farmers suggested that stronger cooperation between the Department of Animal Husbandry, local self-government institutions, veterinary services, and agricultural extension agencies would improve service delivery and make government support more accessible.

These findings support the Sustainable Livelihoods Framework (DFID, 1999), which explains that institutions and government policies play an important role in improving people's access to livelihood resources and reducing vulnerability. When institutional support is weak or inadequate, farmers find it more difficult to recover from repeated economic and environmental shocks. Similar findings have been reported by FAO (2020), World Bank (2021), UNDP (2022), and the Kerala Livestock Development Board (2022), which emphasise that effective compensation, livestock insurance, quality veterinary care, and strong extension services are essential for sustaining livestock-based livelihoods.

Overall, the findings indicate that strengthening institutional support is necessary to improve the resilience of duck farmers in Alappuzha. Better compensation policies, affordable insurance schemes, regular veterinary services, timely vaccine supply, farmer training programmes, and simplified procedures for accessing government schemes would help farmers recover more quickly from crises and improve the long-term sustainability of duck farming.

Theme 5: Family Livelihood, Labour, and Occupational Sustainability

Duck farming in Alappuzha is a family-centered activity that heavily relies on household members’ participation (Agarwal, 2018). Family members play key roles in feeding ducks, managing hatcheries, collecting eggs, maintaining cleanliness, monitoring duck health, and handling daily farm tasks. Often, wives and children actively contribute to these farming activities, emphasizing the collective nature of this work (Bebbington, 1999).

However, participants noted growing challenges in finding labour for farming tasks. Labour shortages have become a significant concern due to an ageing workforce and a lack of interest among younger generations in agricultural work (White, 2020). Farmers also mentioned that labour costs have risen sharply, increasing overall production costs (Scoones, 2015). The shortage of skilled and experienced workers further impacts the efficiency of farm operations (Ellis, 2018). These findings suggest that while family support remains essential for sustaining duck farming, the lack of available labour poses a serious challenge to the long-term viability of the occupation (Chambers & Conway, 1992).

Theme 6: Occupational Identity, Resilience, and Future Uncertainty

A strong sense of occupational identity and emotional connection to duck farming was clear in participants' stories (Walker & Salt, 2012). For many farmers, duck farming is not just a way to earn a living; it is a way of life passed down through generations (Berkes, 2018). Participants expressed pride in their work and emphasized its importance in supporting their families and preserving traditional knowledge (Varghese, 2021).

Despite facing ongoing losses from floods, diseases, rising costs, and market instability, farmers showed remarkable resilience and determination to keep farming (Bene et al., 2014). Their persistence reflects a deep commitment to their work and livelihood. However, worries about the future of duck farming were also evident. Participants observed that younger generations are increasingly drawn to alternative job opportunities, particularly in cities and abroad, due to the risks and uncertainties tied to farming (White, 2020).

This declining interest among youth raises concerns about the future of traditional duck farming practices. Many farmers fear that without sufficient support and improved economic conditions, this occupation may gradually fade (Sen, 2000). The findings, therefore, highlight a complicated relationship between resilience and uncertainty, with farmers committed to their work while questioning its long-term sustainability (Brown, 2016).

Theme 7: Psychological and Emotional Dimensions of Duck Farming

The findings reveal that duck farming affects not only farmers' economic conditions but also their mental and emotional well-being. Repeated losses due to bird flu culling, floods, and market instability create stress, anxiety, and emotional exhaustion among farmers. Case A described the culling of healthy ducks as "extremely painful" and compared it to "cutting down a coconut tree when it has started bearing fruit," showing deep emotional attachment to the

birds. Literature also supports this Delpont et al. (2021) and Letha & Anju (2023) note that farmers often consider livestock as part of their family, and repeated shocks reduce confidence in the future. Case C and Case B also show that women farmers bear additional emotional burdens as they manage both household duties and farm crises. These results suggest that livelihood research must go beyond economic indicators and include psychosocial support, counseling, and community resilience programs for farming families.

Theme 8: Role of Women and Gendered Participation in Duck Farming

The findings of the study reveal that women play a vital yet often under-recognised role in sustaining duck farming households in Alappuzha. Across the case studies, women were actively involved in almost every stage of duck farming, including feeding ducks, cleaning shelters, collecting and sorting eggs, managing hatchery operations, monitoring duck health, maintaining hygiene, marketing products, and supporting overall farm management. In several households, women also balanced domestic responsibilities such as cooking, childcare, and care for the elderly alongside their farming activities. This demonstrates that duck farming is not only a source of livelihood but also a family-based enterprise in which women contribute significantly to daily operations and decision-making.

The study found that women's participation extends beyond labour contribution to include knowledge transfer and continuity of traditional farming practices. For example, Case A highlighted the active involvement of the farmer's wife in hatchery management, egg incubation, and maintaining cleanliness, which were essential for successful production. Similarly, Case C demonstrated the leadership of a woman farmer who inherited duck farming from her father and independently managed duck rearing along with vegetable cultivation. These findings indicate that women possess valuable indigenous knowledge and practical skills that contribute directly to farm productivity and household income.

Despite their significant contribution, the findings reveal that women continue to face multiple gender-related challenges. Participants reported that women often receive limited recognition for their work because duck farming is generally perceived as a family occupation rather than a profession requiring specialised skills. Women also experience increased workloads during disease outbreaks, floods, and other crises, as they must manage household responsibilities while caring for ducks and supporting their families' recovery. Emotional stress is particularly high during periods of compulsory culling and financial losses, as women are deeply involved in both livelihood activities and household management.

Another important finding is that women have limited access to institutional support compared to their contributions to farming. Most participants indicated that training programmes, veterinary awareness sessions, insurance schemes, and financial assistance are generally directed towards the male head of the household. As a result, women often have fewer opportunities to improve their technical knowledge, access formal credit, or participate in decision-making processes related to agricultural development. This institutional gap reduces their capacity to enhance productivity and adapt to changing farming conditions.

The findings further suggest that empowering women through education, training, leadership opportunities, and financial inclusion could significantly strengthen household resilience. Participants believed that providing women with access to scientific farming knowledge, extension services, self-help groups, cooperative societies, and entrepreneurship programmes would improve productivity, diversify household income, and enhance the overall sustainability of duck farming. Women's active participation in local organisations and community networks was also viewed as an important source of mutual support during periods of crisis.

These findings are consistent with the Sustainable Livelihoods Framework (DFID, 1999), which emphasises that human and social capital play a central role in strengthening livelihood outcomes. Women contribute substantially to both forms of capital through their labour, knowledge, caregiving roles, and participation in community networks. Their contribution enhances the adaptive capacity of farming households and supports long-term livelihood sustainability. The findings also align with Gender and Development (GAD) Theory, which argues that women's economic contributions are frequently undervalued despite being essential to household welfare and rural development. Recognising and empowering women as equal partners in agricultural development is therefore critical for achieving sustainable livelihoods.

The present findings support previous studies by Khanum and Mahadi (2015) and Kumari et al. (2014), which concluded that duck farming is particularly suitable for rural women because it requires relatively low investment, limited land resources, and can be integrated with household responsibilities. These studies found that duck farming improves women's income, economic independence, and participation in household decision-making. Similarly, Cheriyan and Jacob (2023) reported that women livestock farmers face disproportionate burdens during disasters and disease outbreaks due to their dual responsibility for family care and livelihood

management. The experiences shared by participants in the present study closely reflect these observations.

Overall, the findings demonstrate that women are indispensable to the success and sustainability of duck farming in Alappuzha. However, their contributions remain insufficiently recognised within institutional support systems and agricultural development programmes. The study therefore recommends promoting gender-sensitive agricultural policies, expanding women's access to training, veterinary extension services, credit facilities, insurance schemes, leadership opportunities, and farmer cooperatives. Recognising women as key stakeholders, rather than merely as family members, will strengthen household resilience, improve livelihood security, and contribute to the sustainable development of duck farming in Kerala.

Theme 9: Need for Scientific Practices, Extension Services and Technology Adoption

The cases highlight a gap between traditional knowledge and scientific duck farming practices. Case A and Case B rely on experiential knowledge passed through generations, managing incubation, seasonal release in paddy fields, and disease identification. However, they also face challenges like low hatchability, inconsistent vaccine supply, and lack of insurance. Nija George et al. (2017) found that only 42.67% of Kuttanad farmers had a favourable attitude toward scientific duck farming, with many preferring traditional nomadic systems. Literature shows that scientific practices, such as proper housing, vaccination, low-cost feed technology, and integrated rice-duck systems, can increase productivity by 20-50% and reduce costs (Hossain et al.; Abraham & Raveendran, 2009). Yet barriers include a lack of extension services, transportation costs for veterinary care, and limited awareness. Both cases and the literature suggest that strengthening capacity building, regular veterinary support, farmer training, and access to low-cost technology are essential for making duck farming more resilient and profitable in the futur

CHAPTER VI

FINDINGS, SUGGESTIONS AND CONCLUSION

6.1 FINDINGS

Based on the thematic analysis of data collected from 7 traditional duck farmers in Alappuzha district, the following major findings emerged:

A. Socio-Economic Findings

Severe Financial Difficulties*:* Duck farmers face severe financial difficulties due to rising costs of feed, veterinary medicines, labour, fuel, and transportation. In contrast, the market prices of duck eggs and meat have remained stagnant, resulting in narrow profit margins and economic strain.

Inadequate Compensation and Insurance*:* Government compensation during disease outbreaks and natural disasters is insufficient and often delayed. It does not cover the actual market value of losses. The absence of a dedicated insurance scheme for duck farming further increases financial vulnerability.

Debt Trap and Loan Dependency*:* Repeated losses from floods and bird flu force farmers to rely on private loans and high interest borrowing. This has led to a cycle of debt and long-term financial insecurity for many households.

High Dependence on Family Labour*:* Duck farming is primarily sustained through family labour. Wives and children actively participate in feeding, egg collection, hatchery management, and cleaning. However, rising wage rates and labour shortages are undermining operational sustainability.

B. Environmental and Health Findings

Frequent Climate and Flood Disruptions*:* Floods, heavy rainfall, and changing climate conditions frequently disrupt farming activities. They damage farm infrastructure, destroy feed storage, contaminate water sources, and cause duck mortality or displacement.

High Mortality Due to Disease Outbreaks*:* Avian influenza (bird flu) and other infectious diseases cause high duck mortality and major economic losses. Compulsory culling of healthy birds under government protocol results in loss of productive assets and future income.

Perceived Role of Migratory Birds in Disease*:* The study found that migratory birds are perceived by duck farmers as a possible source of avian influenza transmission. This perception increases fear of disease outbreaks and economic losses in duck farming.

Environment-Disease Linkage*:* Contaminated floodwater, poor sanitation, and climate variability contribute to disease spread. Environmental vulnerability is thus directly linked to livestock health risks.

C. Social and Occupational Findings

Continuity of Traditional Livelihood*:* Despite multiple challenges, duck farming remains an important traditional livelihood and a source of income for families in Alappuzha. It is culturally valued and passed down through generations.

Low Interest Among Younger Generations: Younger generations show limited interest in duck farming due to low profitability, high risks, and better employment opportunities in cities and abroad. This raises concerns about the future sustainability of the occupation.

Central Role of Women: Women play a central but often under-recognized role in duck farming. They manage incubation, hygiene, feeding, and daily farm operations. However, they have limited access to institutional credit, training, and insurance.

Psychological and Emotional Stress: Repeated shocks from disease culling, floods, and market instability cause stress, anxiety, and emotional exhaustion. Farmers develop an emotional attachment to ducks, and culling is deeply painful.

D. Knowledge and Institutional Findings

Reliance on Indigenous Knowledge: Farmers largely depend on Indigenous and Traditional Ecological Knowledge for grazing management, seasonal timing, and disease identification. This knowledge has enabled survival in wetland conditions for decades.

Gap in Scientific Practices and Technology: There is a significant gap between traditional practices and scientific duck farming methods. Low adoption of scientific housing, vaccination schedules, and low-cost feed technology limits productivity and resilience.

Weak Extension and Veterinary Services: Farmers reported irregular supply of vaccines, delays in veterinary support, and lack of regular extension services. Bureaucratic procedures further reduce access to institutional help.

Need for Integrated Institutional Support: The findings indicate an urgent need for integrated support systems, including subsidized inputs, accessible insurance, scientific training, and flood-resilient infrastructure, to ensure the sustainability of duck farming.

The study concludes that traditional duck farming in Alappuzha faces a multidimensional crisis. While it remains ecologically suitable and culturally important, economic insecurity, climate vulnerability, disease risk, weak institutions, and declining youth interest threaten its future. The key strengths of the system lie in family labour, women's participation, and indigenous knowledge. Strengthening financial, institutional, and technological support while preserving traditional knowledge is critical for the survival of this livelihood.

6.2 Suggestions

Based on the major findings from the case studies of traditional duck farmers in Alappuzha, the following suggestions are proposed for farmers, government, and institutions:

- Revise Compensation Policy: The government should revise compensation rates to reflect the market value of ducks and include compensation for long-term income loss resulting from culling. Payments should be made in a timely and transparent manner.
- Introduce Duck Farming Insurance: A dedicated insurance scheme for duck farming should be established to cover losses from disease, floods, and climate-related disasters, similar to crop insurance.
- Subsidized Inputs: Provide subsidies on duck feed, medicines, vaccines, and fuel to reduce production costs and improve profit margins.
- Access to Low-Interest Credit: Banks and cooperative societies should provide low-interest loans and credit facilities with simplified documentation to help farmers recover after disasters.
- Flood-Resilient Infrastructure: Construct elevated duck sheds and raised feed storage facilities in flood-prone areas like Kuttanad to reduce damage during monsoons.
- Wetland Conservation: Protect and maintain natural grazing areas in paddy fields and canals. Prevent the conversion of wetlands critical to traditional duck grazing.
- Climate Information Services: Provide farmers with seasonal weather forecasts and advisories to help them plan grazing schedules and duck movement.
- Community-Based Disaster Preparedness Plans: Local self-government institutions should develop community-based disaster preparedness and response plans to protect duck farming livelihoods from floods and other climate-related hazards.

- Regular Vaccination and Veterinary Camps: The Department of Animal Husbandry should conduct monthly vaccination drives and free veterinary camps in duck farming clusters.
- Biosecurity Training with Focus on Migratory Birds: Train farmers on biosecurity measures, sanitation, and disease identification. Special awareness programs should be conducted on the role of migratory birds in the transmission of avian influenza and on preventive measures to reduce contact between migratory and domestic ducks.
- Migratory Bird Monitoring System: In coordination with the Forest Department and wetland authorities, establish a system to identify and monitor migratory birds that may carry or spread avian influenza, enabling early warning and disease prevention.
- Timely Vaccine and Medicine Supply: Ensure regular and adequate supply of vaccines and medicines at local veterinary centers to avoid delays during outbreaks.
- Community-Based Disease Surveillance: Establish community-based disease surveillance and monitoring systems for early detection and reporting of bird flu and other diseases, enabling timely intervention and control measures.
- Youth Engagement Programs: The government and NGOs should promote duck farming as a viable agri-enterprise through training, startup support, and market linkages to attract younger generations.
- Women-Centric Support: Recognize women's role by providing training, SHG-based credit, and insurance specifically for women duck farmers. Include them in decision-making and extension programs.
- Strengthen Extension Services: Appoint dedicated livestock extension officers for duck farming to provide regular training on scientific practices, low-cost feed, and integrated rice-duck systems.
- Develop Local Market Facilities: Local self-government institutions should develop local market facilities and direct marketing channels to help farmers sell duck meat and eggs at fair prices without heavy dependence on middlemen.
- Bridge Traditional and Scientific Knowledge: Organise capacity-building programs that combine Indigenous knowledge with scientific practices, such as improved housing, vaccination, and hatchability techniques.
- Promote Low-Cost Technology: Introduce affordable technologies for incubation, feed mixing, and waste management to reduce labour and costs.

- Farmer Collectives and Cooperatives: Form duck farmer producer groups to enable bulk purchase of inputs, collective marketing, and better bargaining power.
- Community-Based Resilience Building: Strengthen community-based resilience through farmer collectives, mutual aid groups, and local governance participation. This will help farmers share resources, information, and support during crises and improve collective recovery capacity.
- The sustainability of traditional duck farming in Alappuzha depends on an integrated and community-driven approach. Economic support alone is not sufficient. It is essential to simultaneously address climate risks, health security, including migratory bird management, institutional gaps, gender equity, and knowledge transfer.
- By strengthening community-based resilience, combining traditional wisdom with scientific and policy support, and ensuring farmer participation in planning and implementation, duck farming can be made economically viable, environmentally resilient, and socially sustainable for future generations.
- The sustainability of traditional duck farming in Alappuzha depends on an integrated approach. Economic support alone is not enough. There is a need to address climate risks, health security, institutional gaps, gender equity, and knowledge transfer simultaneously. By combining traditional wisdom with scientific and policy support, duck farming can be made economically viable, environmentally resilient, and socially sustainable for future generations.

6.3 Conclusion

This study examined the livelihood challenges, adaptive strategies, and resilience of traditional duck farmers in the wetlands of Alappuzha district, Kerala. Through in-depth case studies of 7 farmers, the research explored how economic, environmental, social, and institutional factors shape the sustainability of duck farming in the Kuttanad region. The findings show that while duck farming remains an ecologically suitable and culturally significant occupation, it is currently under severe stress due to multiple interconnected challenges.

The study found that farmers face major financial difficulties todue of rising costs of feed, medicine, fuel, and labour, as well as stagnant market prices for duck eggs and meat. Government compensation during disease outbreaks and floods is inadequate and often delayed, and the absence of a dedicated insurance scheme leaves farmers vulnerable to repeated losses. As a result, many households fall into debt and depend on high-interest loans, which further worsens their economic insecurity. At the same time, duck farming continues to rely

heavily on family labour, with women playing a central yet under-recognised role in daily operations.

Environmentally, the study revealed that floods, heavy rainfall, and climate variability frequently disrupt farming activities and damage infrastructure. Disease outbreaks, especially avian influenza, cause high mortality and income loss. Farmers also expressed concern about migratory birds as a possible source of disease transmission. These environmental and health risks are closely linked, as contaminated floodwater and poor sanitation increase the spread of disease. Despite these risks, farmers continue to rely on Indigenous and Traditional Ecological Knowledge for grazing management, seasonal planning, and disease identification. However, there is a clear gap between traditional practices and scientific methods, with low adoption of improved housing, vaccination, and low-cost technologies.

Institutionally, the study found weak extension services, irregular veterinary support, and bureaucratic barriers in accessing government schemes. Socially, the occupation faces the risk of decline due to low interest among the younger generation, who prefer more stable and profitable jobs. At the same time, farmers expressed a strong emotional attachment to the occupation and reported psychological stress from repeated losses and the compulsory culling of birds.

Based on these findings, the study concludes that the sustainability of traditional duck farming cannot be ensured through economic support alone. An integrated approach is required that addresses financial security, climate resilience, health management, institutional strengthening, and social equity. Specific recommendations include revising compensation policy, introducing insurance, providing subsidized inputs and low-interest credit, building flood-resilient infrastructure, conserving wetlands, and strengthening veterinary and extension services. The study also recommends community-based disaster preparedness, disease surveillance, including migratory bird monitoring, women-centric programs, youth engagement, and promotion of farmer collectives. Bridging traditional knowledge with scientific practices and building community-based resilience are essential for long-term sustainability.

In conclusion, traditional duck farming in Alappuzha represents a unique example of livelihood adaptation in wetland ecosystems. It provides food security, income, and ecological benefits while preserving cultural heritage. However, without timely policy interventions and community participation, this traditional system risks decline. With the right support, duck

farming can be revitalized as an economically viable, environmentally sustainable, and socially inclusive livelihood for future generations in Kerala.

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Annexures

Interview Guide

TITLE OF THE STUDY

Under the livelihood realities of duck farmers in Alappuzha: a qualitative study of socioeconomic and environmental constraints

MAIN RESEARCH QUESTION

How do duck farmers in Alappuzha experience livelihood challenges arising from disease outbreaks, environmental risks, economic pressures, and policy responses, and what coping mechanisms do they adopt at individual, household, and community levels?

SPECIFIC RESEARCH QUESTIONS

- What everyday livelihood challenges do duck farmers face, and how do they respond to them?
- How have repeated H5N1 outbreaks affected farmers' income, livelihood security, and emotional well-being?
- How do farmers perceive and cope with government policies, compensation mechanisms, and institutional responses?
- How do economic pressures such as rising input costs, labour shortages, and debt influence farming sustainability?
- What coping and adaptation strategies do farmers adopt in response to repeated crises?
- How have livelihood disruptions affected farming families, particularly women and children?
- What psychological and emotional impacts do farmers experience, and how do they cope with distress?
- What role do family, community, cooperatives, and formal institutions play in livelihood recovery and coping?

KEY INFORMANT INTERVIEWS

Target Informants

Duck farmers (small, medium, large scale, women, youth, flood prone)

Women members of duck-farming households

Veterinary officials/ Officials from Animal Husbandry Department

Flood prone area farmers

Different age group farmers

1. **Background Information**

- Can you tell me about yourself and your experience in duck farming?
- How long have you been engaged in duck farming, and what scale of farming do you practice?

2. **Everyday Livelihood Challenges**

   What are the main challenges you face in your daily duck-farming activities?
   Which risks do you feel are most threatening to your livelihood, and why?
   How do floods, diseases, or market changes affect your farming routine?
   How do you usually respond when such challenges arise?
   Impact of H5N1 Outbreaks and Coping
   Can you describe your experiences during H5N1 outbreaks?
   How did bird flu affect your income and livelihood security?
   What did losing ducks mean to you personally and economically?
   How did you cope immediately after the losses?
   What long-term strategies did you adopt to recover or continue farming?

3. **Government Policies and Institutional Response**

What government measures did you experience during disease outbreaks (e.g., culling, movement restrictions)?

How would you describe your experience with compensation processes?

Were there delays, and how did they affect your recovery plans?

How did you cope with uncertainty related to government decisions and policies?

Economic Pressures and Financial Coping

How have input costs (feed, medicine, transport) changed over time?

What labour-related challenges do you face, and how do you manage them?

Have you accessed insurance, loans, or credit schemes? How useful were they?

How do you and your family manage debt, reduced income, or financial stress?

Coping and Adaptation Strategies

What coping mechanisms help you manage repeated livelihood disruptions?

Have you changed your farming practices in response to outbreaks or floods?

Do you depend on other income sources? How important is diversification?

How does traditional knowledge or past experience guide your coping strategies?

Socio-Economic Impact on Family and Household Coping

How have livelihood challenges affected your family's living conditions?

How do income losses affect children's education, health care, or nutrition?

Has the role of family members in earning or farm work changed?

How do women and children in your household experience and cope with these challenges?

Psychological and Emotional Experiences

How do repeated losses and uncertainty make you feel emotionally?

Do you experience stress, fear, or anxiety related to farming risks?

How do these emotions affect your motivation and hope for the future?

What personal, family, or community practices help you cope emotionally?

Support Systems and Recovery

What kind of support do you receive from family, neighbours, or cooperatives?

How helpful are government departments or NGOs during crises?

How do social relationships help in emotional and financial recovery?

What additional support do you feel is necessary for long-term livelihood security?

For a Veterinary Department Officer, it is better to ask fewer but deeper questions. Below are 30 specific and important questions that directly support your research objectives.

INTERVIEW GUIDE – VETERINARY DEPARTMENT OFFICER

Basic Profile

Name:

Designation:

Department:

Years of Service:

Years of Experience in Alappuzha District:

Area under Jurisdiction:

Questions

1. How important is duck farming to the rural economy of Alappuzha?

2. What are the major health-related challenges currently affecting duck farming?

3. Which duck production system (migratory or stationary) is more vulnerable to disease, and why?

4. How frequently have H5N1 outbreaks occurred in Alappuzha during the past decade?

5. Which areas are most vulnerable to disease outbreaks?

6. What are the major causes of recurring avian influenza outbreaks?

7. What early warning or surveillance systems are used to detect outbreaks?

8. How quickly does the department respond after receiving a disease report?

9. How aware are farmers about biosecurity measures?

10. What are the most common biosecurity mistakes made by farmers?

11. What preventive measures should farmers adopt to reduce disease risk?

12. How does the movement of migratory duck flocks influence disease transmission?

13. Are veterinary services easily accessible to duck farmers in remote areas?

14. What challenges does your department face in providing veterinary services?

15. Are laboratory facilities adequate for confirming avian influenza cases?

16. What procedures are followed during culling operations?

17. What challenges are encountered while implementing culling?

18. Is compensation generally sufficient to cover farmers' losses?

19. How do delays in compensation affect farmers' livelihood recovery?

20. How long does it usually take for farmers to resume duck farming after an outbreak?

21. What socio-economic impacts do repeated disease outbreaks have on duck-farming families?

22. Have you observed psychological stress, fear, or anxiety among affected farmers?

23. Have repeated outbreaks caused farmers to leave duck farming? Why?

24. Which government schemes are most beneficial for duck farmers?

25. Are existing schemes adequate to support farmers during disease outbreaks?

26. What gaps exist in current disease-control and compensation policies?

27. How effective is coordination between the Veterinary Department, Animal Husbandry Department, Agriculture Department, and Local Self Government Institutions during disease outbreaks?

28. What are the biggest threats to the sustainability of duck farming in Alappuzha?

29. What policy reforms would you recommend to strengthen duck farmers' livelihoods?

30. What long-term measures are necessary to improve resilience against H5N1 outbreaks and future disease risks?