COLLEGE OF BUSINESS AND ECONOMICS

DEPARTMENT OF ECONOMICS

Thesis On;

Investigating the Impacts of Urban Poultry Farming on Household Welfare using Propensity Score Matching Technique: A Case Study of Shire Town in Northern Tigray Region, Ethiopia

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Declaration

I, the undersigned, declare that this thesis entitled "***Investigating the Impacts of Urban Poultry Farming on Household Welfare using Propensity Score Matching Technique: A Case Study of Shire Town in Northern Tigray Region, Ethiopia***" is my original work and has not been presented for any other award, and that all sources of materials used in this thesis are duly acknowledged. This thesis was carried out under the supervision of my principal advisor, Yemane Michael (Ph.D.), Department of **Economics**, College of Business and Economics, Mekelle University, in the academic year of 2025.

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Place: **Mekelle University, Mekelle, Ethiopia**

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Abstract

This study examines the socioeconomic and nutritional impacts of urban poultry farming on household welfare in Shire Town, Tigray, Ethiopia. Using a mixed-methods approach, it combines quantitative data from 306 household surveys with qualitative insights from focus group discussions and key informant interviews. Analytical methods such as Propensity Score Matching and logit regression were applied to assess the causal effects of poultry farming on income, dietary diversity, health, and education outcomes. The results show that urban poultry farming significantly boosts household income, which supports essential expenditures like food, healthcare, and education. Poultry-farming households demonstrated better dietary diversity and more frequent consumption of protein-rich foods, along with improved health status and reduced medical costs. Educationally, these households had higher school enrollment rates and faced fewer financial barriers. Despite these benefits, challenges, including high feed costs, disease outbreaks, limited veterinary services, and market access constraints, affect productivity and growth. The study highlights urban poultry farming's role as a sustainable livelihood strategy and recommends improvements in veterinary care, feed affordability, market infrastructure, and supportive urban policies, with suggestions for further research on health impacts and gender dynamics.

Keywords: Urban, Poultry, Shire, Household, PSM, Logit

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Chapter One

Introduction

1.1 Background of the Study

1.1.1 Historical Context

Urban agriculture, including poultry farming, has a long and diverse history across various civilizations. From the ancient cities of Mesopotamia to the densely populated towns of modern-day Africa, Asia, and Latin America, city dwellers have long practiced small-scale agriculture to supplement food needs and household income. In the African context, particularly in Sub-Saharan Africa, poultry production has become an integral part of urban livelihoods. As urbanization accelerates and rural-to-urban migration increases, the demand for affordable protein sources is expected to continue growing. Consequently, urban and peri-urban poultry farming has emerged not only as a food production strategy but also as a socio-economic buffer against urban unemployment and inflation (FAO, 2010). Cities such as Nairobi, Accra, Addis Ababa, and now Shire Town have experienced a steady rise in backyard and semi-commercial poultry farming practices among households seeking additional income and food security.

Urban poultry farming is a cornerstone of small-scale livestock production across Ethiopia's cities and towns, primarily serving as a vital source of protein and cash income for low-income households. The sector is dominated by the rearing of indigenous chicken breeds in backyard, scavenging systems, which require minimal initial investment. These birds are typically kept for both meat and egg production, providing a critical nutritional safety net and a readily available asset that can be sold to cover emergency expenses. Despite its importance, the sector faces constraints such as high disease prevalence, poor genetic potential of local breeds, limited access to veterinary services, and high feed costs, which keep productivity low and hinder its transition to more commercialized operations.

In Tigray, urban poultry was similarly a key component of household resilience, with many families maintaining small flocks. However, the recent conflict inflicted catastrophic damage on this livelihood. Widespread looting and systematic slaughtering of poultry decimated flocks, while the blockade cut off access to vaccines, veterinary medicines, and commercial feed, leading to devastating disease outbreaks. The loss of

poultry not only eliminated a primary source of nutrition but also destroyed a crucial financial asset for countless urban families, deepening the humanitarian crisis. In the post-war period, rebuilding this sector is a monumental challenge, requiring the restocking of flocks and the reestablishment of shattered veterinary supply chains to restore this essential buffer against hunger and poverty. Urban poultry farming—raising chickens, ducks, or other fowl within or near urban environments has gained particular prominence due to its low space requirements, short production cycles, and relatively low input costs. Historically, poultry farming in urban settings was a response to rising urban poverty, food insecurity, and the need for accessible livelihoods among marginalized groups (Mougeot, 2006).

1.1.2 Economic and Nutritional Importance

Poultry farming contributes substantially to both the economic resilience and nutritional well-being of urban households. Economically, it provides direct income through the sale of eggs, live birds, and processed poultry products. It also reduces household food expenditures by supplying protein-rich foods internally. This dual benefit is particularly important in contexts where unemployment rates are high and formal employment is limited. Urban poultry farming is characterized by its inclusivity—it is accessible to women, youth, and low-income households who may not have the capital or land for larger-scale agricultural activities (Brennan *et al*., 2011; Osei-Antwi & Agyemang, 2019).

Nutritionally, poultry products are recognized as high-quality sources of essential proteins, vitamins (particularly B12), and minerals like zinc and iron. These nutrients are crucial for physical development, cognitive functioning, and immunity, especially among children, pregnant women, and lactating mothers (Tadesse *et al*., 2021; WHO, 2019). In urban areas where processed and carbohydrate-heavy diets dominate, integrating poultry products into regular meals can improve dietary diversity and help combat malnutrition and micronutrient deficiencies. As a result, promoting poultry farming in cities is increasingly being recognized not only as a livelihood strategy but also as a public health intervention.

1.1.3 Dietary Habits in Shire Town

Shire Town, like many urban centers in Ethiopia, is undergoing significant socio-economic transformations that influence dietary patterns and food consumption

behaviors. The growing urban population, rising cost of living, and limited access to diverse food sources have led many households to rely on affordable, energy-dense staple foods such as injera, bread, and lentils. While these staples provide necessary calories, they are often insufficient in terms of protein and micronutrient content, contributing to hidden hunger or micronutrient malnutrition, particularly among children and vulnerable adults.

In this context, poultry products—eggs and chicken meat—remain an underutilized yet highly potent nutritional resource. Despite their benefits, consumption levels in Shire Town remain low due to limited household production, market access constraints, and cultural or economic barriers to regular consumption. Many households view poultry as a luxury rather than a routine part of the diet, consuming it primarily during holidays or special occasions. However, the potential exists for poultry farming to fill critical nutritional gaps, especially if integrated with public awareness campaigns and supportive urban food policies.

Enhancing poultry farming practices and increasing awareness of the health benefits of poultry products could lead to more frequent consumption, particularly among low-income and nutritionally at-risk populations. In turn, this would contribute to better health outcomes, educational performance among children, and reduced health care costs related to nutrition-linked illnesses.

1.1.4 Well-being and Essential Needs in Shire

In the dusty, sun-baked yards of Shire Town, where city life meets the echoes of the countryside, poultry welfare is an act of quiet stewardship. It means the farmer's daily diligence in offering a safe haven—a simple coop that provides cool shade from the relentless sun, a barrier against stray dogs, and a consistent supply of precious clean water and feed. It is in the watchful eye that spots a sickening bird, the knowledge to treat common ailments, and the understanding that even a few chickens need moments of contentment—a patch of earth to dust-bathe or a handful of grain to scratch and peck at. This gentle, attentive care is the foundation that allows these small flocks to not just survive, but to truly flourish, becoming a resilient source of nourishment and a thread of economic hope for the families who tend them.

1.2 Problem Statement

In Ethiopian towns like Shire, a severe crisis of urban food insecurity is unfolding. The combination of rapid city growth, skyrocketing living costs, and profound economic

strain has made it increasingly difficult for low-income families to put nutritious food on the table. With food prices fluctuating wildly and jobs being scarce and poorly paid, many residents cannot meet their basic daily nutritional needs. This dire situation is made worse by deeply entrenched local poverty and high unemployment, problems fueled by regional instability and a lack of formal economic opportunities. Trapped in this cycle, families find themselves unable to afford essential goods, particularly high-quality protein sources like eggs and chicken. This protein deficiency is not just about hunger; it manifests in serious public health issues, including stunted growth in children and weakened immune systems, locking communities into a devastating cycle of poor health and poverty.

Amid these challenges, urban poultry farming emerges as a promising, practical solution that could simultaneously tackle food access, nutrition, and income. However, in Shire Town, this potential remains largely untapped and poorly understood. Significant barriers—such as a lack of training, high initial costs, and minimal institutional support—prevent families from starting poultry ventures. Compounding this problem is a critical gap in research; there have been few, if any, thorough studies that capture the full picture of how poultry farming could transform household well-being in this context. We still don't fully understand its potential ripple effects, such as enabling parents to pay for their children's school fees or affording better healthcare. It is precisely this void that the present study seeks to fill, by conducting a comprehensive evaluation of how urban poultry farming can serve as a sustainable strategy to uplift income, education, health, and nutrition for the people of Shire.

1.3 Objectives

1.3.1 General Objective

The general objective of this study is to investigate the impact of urban poultry farming on household welfare in Shire Town, Northern Tigray Region, Ethiopia.

1.3.2 Specific Objectives

To achieve the general aim, the study is guided by the following specific objectives:

- To assess the economic contributions of poultry farming to household income and expenditure.
- To evaluate the impact of poultry farming on dietary diversity and food security.
- To analyze health and education-related outcomes associated with poultry farming participation.

- To identify challenges faced by urban poultry farmers in Shire Town.

1.4 Research Questions

This study seeks to answer the following key research questions:

- What is the extent of economic benefits derived from urban poultry farming?
- How does a poultry farm influence household dietary diversity and food security?
- What are the health and educational implications of poultry farming income?
- What challenges impede urban poultry farming in Shire Town?

1.5 Significance of the Study

This study carries significant academic, policy-oriented, and practical relevance, particularly in the context of Ethiopia's rapidly urbanizing landscape and ongoing challenges related to food insecurity, unemployment, and malnutrition. Urban poultry farming represents a promising, yet underexplored, strategy to address these challenges, especially for vulnerable populations in towns like Shire.

- Contribution to Policy and Urban Planning

The findings of this research will provide critical insights for policymakers and urban development planners regarding the socioeconomic and nutritional contributions of urban poultry farming. By generating empirical evidence on its role in household income generation, dietary diversity, and social well-being, the study can inform the design of inclusive urban agricultural policies.

- Enhancing Food and Nutritional Security

Given the growing urban population and the corresponding demand for affordable protein, the study underscores how urban poultry farming can directly contribute to food availability and affordability. The study highlights poultry as a readily available source of protein that can significantly improve household dietary diversity and reduce micronutrient deficiencies, especially among children and women of reproductive age.

- Empowerment of Marginalized Groups

The study is especially relevant to the empowerment of women and youth groups that are often excluded from formal employment opportunities. Urban poultry farming is accessible, requires minimal land and investment, and has a relatively quick return on investment, making it an ideal livelihood strategy for these demographics. By analyzing the impact of poultry farming on income distribution and social inclusion, the research contributes to broader gender equity and youth empowerment discourses.

- Practical Guidance for Development Agencies and NGOs

Development organizations and non-governmental actors often implement livelihood and nutrition-related interventions. This study offers them practical data and case-specific evidence to support urban poultry farming as part of integrated urban food systems and livelihood development programs. It can help guide the allocation of resources, development of training materials, and design of community-based poultry projects.

- Academic and Research Value

From a scholarly perspective, the research contributes to filling an empirical gap in existing literature concerning the impact of urban agriculture—specifically poultry farming—on household welfare in small Ethiopian towns. It also applies a mixed-methods approach that integrates both quantitative (e.g., income, food security scores) and qualitative (e.g., lived experiences, challenges) data, making the findings robust and policy-relevant. Furthermore, the use of analytical tools such as Propensity Score Matching (PSM) and logit regression adds rigor and innovation to the study's methodological framework.

In summary, this study not only deepens academic understanding of urban poultry farming's role in poverty alleviation and nutrition but also provides actionable recommendations for stakeholders committed to sustainable urban development in Ethiopia and similar contexts.

1.6 Scope and Limitations of the Study

1.6.1 Scope of the Study

This study is geographically and thematically confined to Shire Town in located in the Tigray region of northern Ethiopia. It specifically examines urban and peri-urban households engaged in poultry farming, focusing on how this agricultural activity influences multiple dimensions of household welfare. These dimensions include:

- ✓ Economic indicators, such as income levels, sources of livelihood, and expenditure patterns.
- ✓ Nutritional indicators, including dietary diversity, food security status, and frequency of poultry product consumption.
- ✓ Health indicators, covering access to healthcare services, self-reported health status, and related expenditures.

- ✓ Educational indicators, including school enrollment rates, educational attainment, and household spending on education.

The study adopts a mixed-methods approach, combining both quantitative (structured surveys) and qualitative (interviews and focus group discussions) tools for data collection. Quantitative data are analyzed using Propensity Score Matching (PSM) and logit regression, while qualitative insights are interpreted through thematic content analysis. The study further utilizes theoretical frameworks such as the Sustainable Livelihoods Framework and Food Security Framework to guide its analysis and interpretation. Furthermore, the target population is restricted to households within the administrative boundaries of Shire Town, excluding rural poultry farmers and commercial-scale producers in 2025 G.C.

1.6.2 Limitations of the Study

While this study offers valuable insights, it is not without limitations:

- ◆ Self-Reporting Bias:

  A significant portion of the data relies on self-reported responses from household heads or adult members. This may introduce recall bias, social desirability bias, or inaccurate reporting, particularly in sensitive areas such as income, health status, and food consumption patterns.
- ◆ Time Constraints:

  Nutritional and health outcomes, especially those related to protein intake and chronic health issues, often require longitudinal data for more accurate assessment. Given the cross-sectional nature of this study, it may not capture long-term impacts or seasonal fluctuations in poultry production and consumption.
- ◆ Sample Size and Generalizability:

  Although the sample size is statistically adequate for the selected study area, findings may not be generalizable to other urban centers in Ethiopia due to variations in socio-economic conditions, urban infrastructure, cultural practices, and market dynamics.
- ◆ External Factors and Environmental Variables:

  The study does not extensively account for external shocks such as market disruptions, disease outbreaks (e.g., avian influenza), or supply chain interruptions, which may affect poultry farming practices and outcomes.

- Limited Biometric or Clinical Data:

  While the study assesses perceived and reported health and nutritional status, it does not include clinical assessments or biochemical tests (e.g., hemoglobin levels, anthropometric measurements), which could offer a more objective evaluation of nutritional and health conditions.

Despite these limitations, the study provides a comprehensive and timely analysis of urban poultry farming's role in enhancing household welfare in Shire Town. The findings are expected to stimulate further research and inform context-specific interventions in similar urban settings across Ethiopia and Sub-Saharan Africa.

Chapter Two

Literature Review

2.1 Introduction to Urban Agriculture

Urban agriculture is an increasingly important component of urban development, food systems, and poverty reduction strategies, especially in low- and middle-income countries. It encompasses a diverse range of agricultural practices carried out within city boundaries and in the peri-urban fringe, offering both subsistence and commercial benefits. This section provides a detailed understanding of the definition, relevance, and historical context of urban agriculture.

2.1.1 Definition and Relevance

Urban agriculture is broadly defined as the cultivation of crops, the rearing of livestock, and the processing and distribution of agricultural products within and around urban areas (Mougeot, 2006). This form of agriculture includes a variety of production systems ranging from backyard gardening and rooftop farming to more intensive commercial poultry and dairy production. It involves not only the growing of food crops and the raising of animals but also related activities such as processing, distribution, and marketing.

The relevance of urban agriculture has increased significantly in recent decades due to rapid urbanization, rising food prices, climate change, and growing urban poverty. According to Zezza and Tasciotti (2010), approximately 15–20% of the world's food is produced in urban areas, a figure that continues to grow with urban expansion. In many developing cities, urban agriculture acts as a buffer against hunger, particularly for marginalized communities who may not have regular access to formal employment or affordable food sources (Zezza and Tasciotti 2010).

In Ethiopia and other sub-Saharan African nations, urban agriculture is increasingly promoted as a strategy to enhance food security and income diversification. It serves not only as a means of subsistence but also as a tool for community empowerment, economic inclusion, and environmental sustainability. Urban agriculture improves household food availability, supports women's economic participation, and enables youth employment (FAO, 2010; Drechsel & Dongus, 2010). It also contributes to urban greening and waste recycling through the reuse of organic waste and wastewater for composting and irrigation, respectively (van Veenhuizen, 2006).

Moreover, in the context of global challenges such as climate change, supply chain disruptions, and migration pressures, urban agriculture has emerged as a resilient strategy that strengthens urban food systems and enhances local self-reliance (RUAF Foundation, 2013). Cities that integrate urban agriculture into their planning frameworks are better positioned to meet Sustainable Development Goals (SDGs) related to zero hunger, poverty reduction, sustainable cities, and responsible consumption.

2.1.2 Historical Overview

Urban agriculture has a long history that spans civilizations and continents. In ancient Mesopotamia, the Aztec chinampas (floating gardens), and the walled gardens of medieval European towns, food was regularly grown within or adjacent to urban settlements as a means of survival and social cohesion (Smith, 2001). The practice intensified during periods of economic and political crisis, especially during wartime and in post-disaster recovery periods.

One of the most iconic historical examples is the "Victory Gardens" movement during World War I and World War II in the United States, United Kingdom, Canada, and other countries. Governments encouraged citizens to grow fruits and vegetables in backyards, schoolyards, and public parks to supplement food rations and support the war effort (Hoffman, 2011). By 1944, Victory Gardens in the U.S. alone were producing over 40% of the nation’s vegetable supply, showcasing the potential of community-based urban food production (Lawson, 2005).

In sub-Saharan Africa, urban agriculture has been practiced informally for generations. During economic downturns and structural adjustment periods in the 1980s and 1990s, many African households turned to urban farming as a survival strategy. Cities such as Accra, Nairobi, and Addis Ababa have well-documented histories of urban farming serving as a critical supplement to household incomes and diets (Maxwell *et al*., 2000; Foeken, 2006).

In recent years, the practice has gained renewed interest due to rapid urban growth and increasing pressure on urban food systems. Modern innovations—such as vertical farming, hydroponics, and urban poultry operations—have further diversified how urban dwellers engage in agriculture (Altieri *et al*., 2017). Governments, NGOs, and international development organizations now recognize the strategic importance of urban agriculture for inclusive development and climate resilience.

2.2 Overview of Poultry Farming

Poultry farming is one of the most accessible and economically significant sectors of livestock production globally, particularly in developing countries. It involves the rearing of domesticated birds primarily for meat and egg production and has grown into a key component of both rural and urban agricultural systems. In urban contexts, poultry farming provides an opportunity for low-income households to generate income, improve food security, and access high-quality animal protein.

2.2.1 Types of Poultry Farming

Poultry farming involves a wide range of domesticated avian species, most commonly chickens, but also ducks, turkeys, geese, guinea fowls, quails, and even pigeons in some cultural contexts. These birds are raised either for meat (broilers) or for eggs (layers), and sometimes for both in dual-purpose systems.

In Ethiopia, poultry production is largely dominated by chickens, with three main production systems identified:

Traditional or Backyard Systems: This is the most widespread system, characterized by free-range, low-input, and low-output farming. Birds are usually indigenous breeds, known for their resilience to harsh environments but with relatively low productivity in terms of egg and meat yield (Aklilu *et al*., 2008).

Semi-Intensive Systems: These involve some degree of confinement and feeding, often combining local and improved breeds. This system allows for higher productivity while maintaining affordability and manageability, especially in peri-urban areas (Fisseha *et al*., 2010).

Intensive Commercial Systems: Common in larger cities and peri-urban zones, this system uses exotic breeds (such as White Leghorn layers or Cobb 500 broilers), standardized feed, controlled housing, and veterinary care. It requires higher capital and technical knowledge but offers significantly higher outputs (Tadelle *et al*., 2003).

Women and youth often play a significant role in poultry management in all three systems, making poultry farming an important avenue for gender-sensitive and youth-inclusive livelihood development (FAO, 2011).

Furthermore, the adaptability of poultry farming to limited space and urban settings makes it suitable for integration into small-scale urban agricultural initiatives. Poultry

requires less capital and land compared to other livestock such as cattle or goats, making it a practical option for urban and peri-urban dwellers.

2.2.2 Growth Trends

Poultry farming in urban and peri-urban Ethiopia has witnessed notable growth over the past two decades. This trend is primarily driven by several socio-economic and demographic factors:

Rising Urban Demand for Animal Protein: With increased urbanization and population growth, there is a corresponding rise in the demand for affordable sources of animal protein, such as chicken meat and eggs. Eggs are considered an inexpensive, nutrient-rich food, especially beneficial for children and pregnant women (FAO, 2019).

Unemployment and Livelihood Diversification: With limited formal employment opportunities, many urban dwellers—particularly women and youth—have turned to poultry farming as a viable means of livelihood. It provides relatively quick returns compared to crops or larger livestock, thus appealing to low-income groups seeking income-generating opportunities (Dawit *et al*., 2021).

Government and NGO Support: Various government-led initiatives and development programs have promoted small-scale poultry farming through capacity building, input supply (e.g., day-old chicks, feed, and vaccines), and market linkage support (MoA, 2020).

Improved Breeds and Technologies: The introduction of improved dual-purpose breeds like Sasso, Koekoek, and Bovans Brown has contributed to increased productivity in both meat and egg production, encouraging more urban households to invest in poultry farming (Tekle *et al*., 2020).

Cities such as Addis Ababa, Bahir Dar, Dire Dawa, Hawassa, and Mekelle have reported an increasing number of urban poultry farmers engaged in both subsistence and small-scale commercial production. Poultry products are also gaining traction in urban markets and supermarkets, reflecting changing consumption patterns and increased health awareness among consumers (Alemayehu *et al*., 2021).

However, despite these encouraging trends, urban poultry farming still faces several constraints, including access to quality feed, veterinary services, land, and credit, as well as exposure to market volatility and disease outbreaks. These challenges must be addressed to sustain the growth trajectory and fully harness the socio-economic potential of poultry farming in urban Ethiopia.

2.3 Economic Impacts of Urban Poultry Farming

Urban poultry farming is increasingly recognized as a vital contributor to household economies and urban food systems in many low- and middle-income countries. Its economic importance stems not only from direct income generation but also from its role in creating employment opportunities, stimulating local markets, and providing resilience to vulnerable urban households.

2.3.1 Income Generation

Urban poultry farming provides households with a reliable and often regular source of cash income through the sale of poultry products such as eggs, meat, and live birds. This income plays a crucial role in meeting daily household expenses, including purchasing food, paying school fees, and covering healthcare costs.

Osei-Antwi and Agyemang (2019) emphasize that poultry income enables households to improve their overall economic stability, helping them cope with urban living costs and unexpected financial shocks. The relatively short production cycle of poultry, especially layers which start producing eggs within a few months, allows for quicker cash turnover compared to other agricultural enterprises.

In a study conducted in urban Ghana, Amole *et al.* found that poultry farming accounted for as much as 40% of the total household income among participants. This highlights the substantial role poultry farming can play in supplementing incomes in resource-constrained urban environments (Amole *et al.* 2013).

In addition, poultry farming often serves as an important source of capital accumulation. The sale of birds or eggs can provide funds for reinvestment into other income-generating activities or for household assets, contributing to long-term livelihood improvement (Mekonnen *et al.*, 2018).

2.3.2 Employment Opportunities

Beyond the farmers themselves, urban poultry farming generates employment along multiple stages of the value chain. These include:

- Input Suppliers: Providers of feed, chicks, vaccines, and veterinary supplies.
- Service Providers: Veterinary officers, extension workers, and animal health technicians.

- Processing and Marketing: Individuals involved in slaughtering, packaging, transportation, and sales in both formal and informal markets.

Karanja points out that urban poultry farming is a significant source of self-employment for women and youth, who are often marginalized in formal labor markets. The low entry barriers—such as minimal land requirement and relatively low start-up capital—make poultry farming an accessible livelihood option, fostering entrepreneurship and economic inclusion in urban settings Karanja, 2011).

Moreover, poultry farming activities contribute to seasonal or casual employment, particularly in feed production and marketing sectors, thus supporting broader urban economies and reducing unemployment pressures (FAO, 2011).

2.3.3 Case Studies

Several empirical studies in African cities provide strong evidence of the positive economic impacts of urban poultry farming: Nairobi, Kenya: Karanja (2011) documents that urban poultry farming contributes significantly to household income, with farmers reporting that earnings from poultry activities are used to cover school fees, food purchases, and emergency expenses. The study highlights how poultry farming provides an important safety net for low-income urban dwellers.

Addis Ababa, Ethiopia: Mekonnen *et al*. show that urban poultry farmers benefit from diversified income sources, combining poultry with petty trading and casual labor. The study finds poultry farming to be scalable and adaptable, with potential to enhance income stability and reduce vulnerability to poverty among urban households (Mekonnen *et al*. 2018).

These case studies collectively demonstrate that urban poultry farming not only supports household-level economic welfare but also strengthens urban food systems by increasing the availability of animal protein and creating livelihood opportunities. They underscore the potential of urban poultry farming to contribute to poverty alleviation and food security when supported by appropriate policies and extension services.

2.4 Nutritional Benefits of Poultry Farming

Urban poultry farming contributes not only to economic welfare but also plays a vital role in improving the nutritional status of households, particularly in low-income urban settings where malnutrition and dietary deficiencies remain widespread challenges.

2.4.1 Protein Source

Poultry meat and eggs are among the richest sources of high-quality animal protein, containing all essential amino acids required for optimal growth, development, and maintenance of body functions. Unlike plant-based proteins, animal proteins have higher digestibility and bioavailability, making poultry products crucial in addressing protein-energy malnutrition (PEM), especially among vulnerable groups such as children under five, pregnant and lactating women, and the elderly (FAO, 2019).

The micronutrient profile of poultry products is also noteworthy; eggs and meat provide important vitamins and minerals, including vitamin B12, iron, zinc, and selenium, which are often lacking in staple cereal-based diets common in urban Ethiopia and other developing countries. Adequate intake of these nutrients supports immune function, cognitive development, and overall health (Gordon *et al*., 2019).

FAO (2019) emphasizes that poultry products are cost-effective and culturally acceptable sources of animal protein, making them critical in food security strategies aimed at reducing malnutrition and improving health outcomes at the community level.

2.4.2 Dietary Diversity

Dietary diversity—the variety of different food groups consumed over a reference period—is a well-established proxy for diet quality and nutrient adequacy (Ruel, 2003). Households engaged in poultry farming tend to consume eggs and poultry meat more frequently, which enhances the variety of foods in their diets beyond staple grains and tubers.

Home-reared poultry reduces reliance on market purchases, allowing families to incorporate nutrient-dense animal-source foods into daily meals. This increased access contributes to better-balanced diets and supports optimal child growth and development, reducing risks of stunting, wasting, and micronutrient deficiencies (Neumann *et al*., 2003).

In many urban settings, where income constraints often limit access to diverse diets, poultry farming provides a sustainable means to improve household food quality and nutrition. The presence of poultry products can encourage dietary shifts from carbohydrate-dominated meals towards inclusion of proteins and micronutrients, critical for long-term health and productivity (Gelli *et al*., 2017).

2.4.3 Research Evidence

Empirical studies affirm the positive nutritional impacts of poultry ownership. Tadesse *et al*. (2021) conducted a study in Ethiopia showing that households with poultry had significantly better dietary outcomes, including higher frequency of egg and meat consumption, and observed lower rates of stunting and undernutrition among children under five.

Similarly, Alders and Pym report that poultry farming increases food availability year-round, buffering households against seasonal food insecurity. This steady availability of animal-source foods helps maintain consistent nutrient intake, which is crucial in preventing growth faltering and micronutrient deficiencies (Alders and Pym 2009).

Other research in Sub-Saharan Africa confirms that poultry ownership correlates with improved child growth indicators, better household food security, and greater dietary diversity scores (Iannotti *et al*., 2017; Herforth & Harris, 2014). These findings suggest that poultry farming not only provides economic returns but also acts as a practical nutrition-sensitive intervention.

2.5 Social Implications of Urban Poultry Farming

Urban poultry farming is not only an economic and nutritional activity but also has profound social effects within urban communities. Its influence extends to strengthening social networks, empowering marginalized groups, and fostering community resilience in the face of socio-economic challenges.

2.5.1 Community Engagement

Urban poultry farming serves as a catalyst for local community engagement by encouraging shared knowledge, pooling of resources, and cooperative marketing initiatives. Bennett emphasizes that such communal agricultural practices build social networks that enable farmers to collectively address challenges such as disease management, feed procurement, and access to markets. These networks facilitate the exchange of best practices, enhance social learning, and create informal support systems, thereby promoting collaborative problem-solving (Bennett, 2010).

Furthermore, community engagement through urban poultry farming often manifests in farmer groups, cooperatives, or informal associations that provide a platform for collective bargaining, resource sharing, and capacity building. These groups enhance social cohesion by reducing social isolation, particularly among vulnerable urban residents, and increase the capacity of communities to respond effectively to economic shocks or food crises (Mougeot, 2006).

2.5.2 Empowerment of Women and Youth

Small-scale urban poultry farming is disproportionately dominated by women and youth, largely because of its low capital requirements, manageable scale, and flexible working hours (FAO, 2011). This accessibility makes poultry farming a vital avenue for economic empowerment and social inclusion.

The involvement of women in poultry farming enhances their participation in household decision-making, increases their financial autonomy, and contributes to gender equity by shifting traditional gender roles (Njuki & Sanginga, 2013). Women often control poultry-related income, which they reinvest in household welfare, children's education, and healthcare, thereby amplifying the socio-economic benefits at the family level (FAO, 2011).

Similarly, urban poultry farming provides important employment opportunities for youth, particularly in cities facing high unemployment rates. In Ethiopia, Tesfaye *et al*. highlight that poultry farming has become a critical strategy for youth livelihood diversification and economic self-reliance. By engaging in poultry production, young people gain skills, entrepreneurial experience, and income, which can reduce social marginalization and foster positive community involvement (Tesfaye *et al*. 2015).

2.5.3 Social Cohesion

Poultry farming activities contribute significantly to building social capital and cohesion within urban neighborhoods. Scoones posits that livelihood strategies like urban agriculture strengthen social ties by fostering mutual cooperation, trust, and collective action among community members. This social capital is critical for resilience, enabling communities to collectively manage risks such as economic downturns, food insecurity, and environmental challenges (Scoones, 1998).

Groups of urban poultry farmers often engage in joint ventures such as collective feed buying, shared veterinary services, or communal marketing schemes, which promote trust and a shared sense of purpose. This collaboration not only improves economic efficiency but also reinforces social bonds and community solidarity (Mekonnen *et al*., 2018).

Moreover, social cohesion derived from poultry farming can transcend economic benefits, promoting cultural identity, collective responsibility, and community well-being. Such cohesion is especially important in urban settings where rapid population growth and migration can lead to fragmented social structures (Maxwell & Zziwa, 1992).

2.6 Challenges Faced by Urban Poultry Farmers

Urban poultry farming, while offering significant socioeconomic benefits, is often constrained by a range of challenges that limit productivity, profitability, and sustainability. These challenges stem from technical, economic, infrastructural, and regulatory factors that urban farmers must navigate daily.

2.6.1 Common Obstacles

Urban poultry farmers confront numerous operational challenges that affect both the health of their flocks and overall production efficiency. One of the most critical issues is the high cost of feed, which constitutes a large portion of the production expenses. Fluctuations in feed prices, often driven by supply shortages or inflation, reduce profit margins and can discourage farmers from expanding their operations (Osei-Antwi *et al*., 2018).

Disease outbreaks represent another significant threat. Newcastle Disease, Avian Influenza, and other infectious diseases can rapidly decimate poultry stocks, leading to heavy economic losses. Lack of access to timely veterinary services exacerbates this problem, as many urban poultry farmers have limited knowledge of disease prevention and control measures. Osei-Antwi *et al*., 2018) highlight that insufficient veterinary extension services and limited availability of vaccines in urban settings undermine flock health and sustainability.

In addition, theft and predation present persistent risks, especially in peri-urban or informal settlement areas where security is weak. These issues create uncertainty and

risk for farmers, discouraging long-term investments in poultry farming infrastructure and technology.

2.6.2 Market Access and Competition

Even when production is successful, urban poultry farmers face challenges in accessing profitable and reliable markets. In many Ethiopian cities, the poultry trade is dominated by informal markets characterized by poor infrastructure, such as inadequate transportation networks, a lack of cold storage facilities, and unsanitary market environments. These conditions contribute to post-harvest losses, reduced product quality, and diminished consumer confidence (Mekonnen *et al*., 2018).

Small-scale poultry farmers often lack bargaining power when negotiating prices with middlemen or retailers, resulting in lower income shares. Furthermore, competition with large-scale commercial poultry producers and imports can depress local market prices, making it difficult for smallholders to sustain profitable operations.

Limited access to formal market channels, such as supermarkets or institutional buyers, also restricts the growth potential of urban poultry enterprises. Mekonnen *et al*., 2018) emphasize that improving market linkages, infrastructure, and farmer organizations could help small urban producers gain better market access and improve income stability.

2.6.3 Regulatory Issues

Urban poultry farming is also shaped by municipal policies and regulations, which can sometimes be restrictive or ambiguous. Concerns over public health risks, such as zoonotic disease transmission, noise pollution, odor, and waste management, lead some city authorities to impose restrictions or outright bans on keeping poultry within city limits (Njeru, 2016).

Space constraints in densely populated urban areas further limit the feasibility of poultry farming. Many urban residents live in small homes or rental units where poultry rearing is impractical or prohibited by landlords.

Njeru 2016) argues that urban planning frameworks often overlook the economic and nutritional benefits of urban agriculture, including poultry farming, and tend to focus primarily on sanitation and aesthetics. There is a growing call for more inclusive policies that balance public health concerns with the need to support sustainable urban livelihoods. This includes establishing guidelines for safe and hygienic poultry keeping,

integrating urban agriculture into land use planning, and providing technical support and infrastructure to urban farmers.

2.7 Theoretical Framework

The theoretical framework guides the analysis and interpretation of how urban poultry farming affects household welfare in Shire Town. It integrates concepts from sustainable livelihoods and food security frameworks to provide a comprehensive understanding of the multifaceted impacts of poultry production in urban settings.

2.7.1 Sustainable Livelihoods Framework

The Sustainable Livelihoods Framework (SLF), as conceptualized by Scoones (1998), provides a holistic approach to understanding how households maintain and improve their well-being through various livelihood strategies. This framework centers on the idea that people's livelihoods depend on their ability to access and mobilize five key types of capital:

- Human capital: Skills, knowledge, health, and labor capacity.
- Social capital: Networks, relationships, and social claims.
- Financial capital: Savings, credit, and income.
- Natural capital: Natural resources such as land, water, and biodiversity.
- Physical capital: Infrastructure, tools, and technology.

Urban poultry farming contributes to these capitals in multiple ways. For instance, it enhances financial capital by providing a steady source of income through the sale of eggs and meat, which supports household expenditures on education, healthcare, and other needs. It builds human capital by increasing farmers' knowledge and skills related to animal husbandry and business management. Through cooperative groups and community networks, poultry farming strengthens social capital, fostering collective action, knowledge sharing, and mutual support.

Although urban poultry farming may rely less on natural capital compared to rural farming, it often utilizes limited urban space efficiently and sometimes integrates with urban waste recycling to reduce feed costs, indirectly supporting sustainability. Additionally, physical capital such as poultry housing, feeding equipment, and transport infrastructure is critical to efficient production and market access.

The SLF emphasizes that sustainable livelihoods require resilience to shocks and stresses, such as market fluctuations or disease outbreaks. Poultry farming in urban

areas often functions as a coping and adaptive strategy, enhancing household capacity to withstand economic or food security crises (Scoones, 1998). Thus, this framework is instrumental in understanding the multidimensional contributions of poultry farming beyond just income, encompassing social and nutritional well-being.

2.7.2 Food Security Framework

The Food and Agriculture Organization (FAO) of the United Nations (2006) defines food security through four essential pillars that must be simultaneously achieved for households to be considered food secure:

- Availability: Sufficient quantities of food are available consistently.
- Access: Economic and physical access to adequate food.
- Utilization: Proper biological use of food, requiring nutritious diets, clean water, sanitation, and healthcare.
- Stability: Reliable access to adequate food at all times without risk of sudden shocks or cyclical food shortages.

Urban poultry farming impacts all four pillars directly and indirectly. It enhances food availability by producing fresh animal protein locally, reducing dependence on distant food supply chains and seasonal variability. Through the income generated, poultry farming improves food access by enabling households to purchase diverse foods and meet other essential needs.

Regarding utilization, poultry products are nutrient-dense, providing high-quality protein, essential vitamins, and minerals that are vital for health, especially among vulnerable groups such as children, pregnant women, and the elderly. This contribution helps reduce malnutrition and improve overall dietary quality (FAO, 2019).

By linking poultry farming to these dimensions of food security, this framework facilitates a nuanced analysis of how urban agriculture contributes not only to food availability but also to affordability, utilization, and resilience, all critical for improving urban household welfare.

2.8 Empirical Review

This section reviews existing empirical studies that investigate the multifaceted impacts of urban poultry farming on income generation, nutritional status, and social dynamics, and identifies research gaps relevant to the Ethiopian urban context.

2.8.1 Impact on Income Generation

Poultry farming has been consistently recognized as an important source of supplementary income for urban households, especially in contexts where formal employment opportunities are limited or unstable. Omore et al. (2004) conducted a comprehensive study across several East African cities, including Nairobi and Kampala, demonstrating that poultry production ranks among the top three agricultural income-generating activities within urban and peri-urban areas. Their findings indicate that small-scale poultry enterprises not only provide households with a reliable source of cash but also help smooth income fluctuations caused by economic shocks or seasonal unemployment.

In Ethiopia, similar trends have been observed where urban poultry farming serves as an accessible livelihood option for marginalized groups, including women and youth (Dawit *et al*., 2021). Income from poultry sales often finances daily household needs such as food, school fees, and medical expenses, highlighting its role in poverty alleviation and economic resilience. Moreover, the relatively low capital requirement and quick turnover of poultry products make this enterprise especially attractive for urban dwellers seeking to diversify income sources.

2.8.2 Nutritional Benefits

Poultry products—eggs and meat—are rich sources of high-quality protein and essential micronutrients, including iron, zinc, and vitamin B12, which are often deficient in predominantly cereal-based diets common in urban poor populations (WHO, 2019). The inclusion of poultry products in household diets has been linked to improved nutritional outcomes, particularly among vulnerable groups such as young children, pregnant women, and the elderly.

Empirical research underscores the positive impact of poultry consumption on reducing protein-energy malnutrition and micronutrient deficiencies. For instance, studies in sub-Saharan African cities demonstrate that households with regular access to poultry products show better dietary diversity scores and lower prevalence of stunting and anemia (Alders & Pym, 2009; Tadesse *et al*., 2021). These nutritional improvements not only enhance physical growth but also cognitive development in children, thereby influencing long-term health and educational performance.

Furthermore, urban poultry farming can improve food availability throughout the year, helping to mitigate seasonal food insecurity that disproportionately affects the urban poor. This consistent access to animal-source foods is critical for maintaining adequate nutrition in rapidly growing urban centers.

2.8.3 Social Implications

Beyond economic and nutritional benefits, urban poultry farming plays a vital role in promoting social empowerment and community engagement. The Food and Agriculture Organization (FAO, 2011) highlights that poultry farming is predominantly undertaken by women and youth, who gain economic independence and increased decision-making power within their households. This empowerment positively influences intra-household resource allocation, often leading to better health and educational investments for children.

Njuki *et al*., 2011) further affirm that women's control over poultry income enhances gender equity by providing them with financial autonomy and increased bargaining power in family decisions. In many urban settings, poultry farming also fosters social cohesion through the formation of farmer groups and cooperatives, where members share knowledge, resources, and market access strategies.

2.8.4 Gaps in Existing Research

Despite the growing recognition of the multifaceted benefits of urban poultry farming, research that simultaneously examines economic, nutritional, and educational outcomes remains limited, particularly in Ethiopian urban contexts. Most existing studies tend to focus on either income generation or nutritional status in isolation, without integrating these dimensions to capture the full scope of poultry farming's impact on household well-being.

Additionally, quantitative assessments dominate the literature, with a paucity of mixed-methods research that combines statistical analyses with qualitative insights. Such approaches are essential to understand contextual factors, social dynamics, and the lived experiences of urban poultry farmers.

There is also a notable scarcity of studies focusing on smaller urban centers like Shire Town, where unique socio-economic and infrastructural conditions may influence poultry farming differently compared to larger cities. Addressing these gaps through comprehensive, context-specific research will provide a more nuanced understanding

of how urban poultry farming can contribute to sustainable urban development and poverty reduction in Ethiopia.

Chapter Three

Research Methodology

3.1 Study Area

Shire Town, located in the northwestern zone of the Tigray region in Ethiopia, serves as the administrative and economic center of the area. It is characterized by rapid urbanization driven by increasing migration from surrounding rural areas and expanding commercial activities. The town's growth reflects broader urban development trends seen across many secondary cities in Ethiopia, where urban populations are rising and diversifying economic livelihoods.

3.1.1 Demographic Profile

Shire Town has a population estimated at over 70,000 residents, with a youthful demographic structure typical of many Ethiopian towns. The population includes a mix of ethnic groups, predominantly Tigrayans, and is characterized by a relatively high dependency ratio, where a significant proportion of inhabitants are children and young adults. This demographic pattern creates both opportunities and challenges for economic development and social services.

The urban population experiences a blend of traditional and modern lifestyles, with many households engaging in informal economic activities alongside formal employment. Household sizes vary, but many tend to be larger than typical urban averages due to extended family living arrangements. The town's social fabric is strengthened by close-knit community networks, which play a vital role in mutual support and resource sharing.

Education levels in the Shire are gradually improving, with several primary and secondary schools serving the area. However, access to higher education remains limited, prompting some youth to migrate to larger cities for further studies or employment.

3.1.2 Economic Activities

Shire Town's economy is diverse, comprising trade, small-scale manufacturing, service provision, and agriculture. Agriculture remains an important livelihood strategy despite urbanization, with urban farming practices—including poultry rearing—being widely adopted. Urban poultry farming, in particular, has emerged as a critical source of income for many households, especially those facing limited access to formal employment.

Poultry farming in Shire operates predominantly at a small scale, often as backyard or semi-intensive systems, allowing families to generate cash income from the sale of eggs and meat while simultaneously meeting their own nutritional needs. The sector is supported by local feed suppliers, informal veterinary services, and urban markets that facilitate the sale of poultry products.

In addition to poultry, other forms of urban agriculture, such as vegetable gardening, also contribute to household food security and income. Trade activities, including retail shops, street vending, and transport services, complement agricultural income and offer alternative employment opportunities for urban residents.

The combination of these economic activities underscores the resilience of urban households in Shire Town, who diversify their income sources to manage economic risks and improve their living standards amid ongoing urban growth.

3.2 Research Design

This study employed a mixed-methods research design, integrating both quantitative and qualitative approaches to comprehensively investigate the multifaceted impacts of urban poultry farming on household livelihoods, nutrition, and socio-economic dynamics. The use of mixed methods enables triangulation of data, enhancing the validity and depth of findings by combining the strengths of both numerical measurement and contextual understanding.

Quantitative data were collected through structured household surveys to generate statistically robust evidence on income generation, dietary diversity, and other

measurable outcomes associated with poultry farming. These surveys allowed for the collection of standardized information from a representative sample, facilitating comparisons between poultry farming households and those not engaged in poultry production.

3.2.1 Rationale for Propensity Score Matching (PSM)

To accurately estimate the impact of poultry farming on household outcomes, this study utilized Propensity Score Matching (PSM) as a statistical technique to reduce selection bias. Selection bias arises when households self-select into poultry farming based on certain characteristics, making direct comparisons between poultry farmers and non-farmers potentially misleading.

PSM addresses this by creating a matched sample of poultry farming and non-farming households with similar socio-demographic profiles, including factors such as age, education level, household size, income, and urban location. By matching households on these observed covariates, PSM simulates a quasi-experimental design, allowing for a more reliable estimation of the causal effects of poultry farming on variables like income, food security, and nutritional status.

This approach improves the validity of the impact assessment by controlling for confounding variables that may influence both the decision to engage in poultry farming and the outcomes of interest. Consequently, PSM provides a robust method for evaluating the net benefits of poultry farming, isolating its contribution from other socio-economic factors.

In summary, PSM enhances the rigor of this study's quantitative analysis by ensuring that comparisons are made between statistically comparable groups, thereby producing more credible and policy-relevant conclusions.

3.3 Source of Data

The study utilized both primary and secondary data sources to ensure a comprehensive analysis of the socioeconomic and nutritional impacts of urban poultry farming in Shire Town. Combining these data types allowed for triangulation of information, enhancing the validity and reliability of the findings.

3.3.1 Primary Data

Primary data were collected directly from urban households engaged in poultry farming as well as those not engaged in such activities, to provide comparative insights. The following methods were employed:

- Structured Questionnaires:

  A detailed questionnaire (see Appendix A) was administered to sampled households to gather quantitative data on demographics, poultry farming practices, income sources, household expenditures, dietary habits, and health and education outcomes. The questionnaire was designed to capture both objective measures (e.g., income levels, number of poultry owned) and subjective perceptions (e.g., challenges faced, perceived benefits).

- Key Informant Interviews:

  Semi-structured interviews were conducted with local agricultural extension officers, poultry farmers' association leaders, veterinary service providers, and market actors. These interviews provided qualitative insights into the broader context of urban poultry farming, policy environment, and support mechanisms.

3.3.2 Secondary Data

Secondary data sources were reviewed to contextualize primary findings and support the analysis:

- Government Reports and Statistics:

  Relevant data were obtained from reports published by the Shire Town Municipality, the Tigray Regional Bureau of Agriculture, and the Ethiopian Central Statistical Agency. These reports provided demographic profiles, economic indicators, urban development plans, and agricultural extension service information pertinent to the study area.

- Academic and Institutional Literature:

  Existing research articles, theses, policy briefs, and reports from organizations such as the Food and Agriculture Organization (FAO), International Livestock Research Institute (ILRI), and various Ethiopian universities were reviewed. This literature informed the study's conceptual framework, methodology, and interpretation of findings.

- Market and Value Chain Data:

  Where available, secondary information on poultry market prices, supply chains, and consumer demand trends in Shire and surrounding urban centers was

incorporated to better understand the economic environment faced by urban poultry farmers.

The integration of secondary data helped validate primary data results, identified gaps in current knowledge, and ensured the research aligned with regional development priorities and evidence-based policy making.

3.4 Sampling and Sampling Techniques

To ensure that the study's findings accurately represent the diverse experiences of urban households in Shire Town with regard to poultry farming, a rigorous sampling strategy was employed. The sampling approach was designed to capture a balanced representation of households both engaged and not engaged in poultry farming, thereby enabling comparative analysis of socioeconomic and nutritional impacts.

3.4.1 Sampling Technique

The study used stratified random sampling technique. Shire has five tabias, such as 01, 02, 03, 04, 05. From those tabias three tabias have been selected randomly, such as 01, 02, and 03. The respondents were selected by stratified random sampling

Table 1: Sampling Technique Steps

Systematic random sample 306 household heads

Tabia	Household Head
01	2000
02	1800
03	2260
Total	6060

Stratified random sample 306 household heads

3.4.2 Sample Size

To determine the sample size, Slovin's formula will be applied:

Slovin's Formula is used in statistics to calculate the minimum sample size (n) required to survey a population of a known size (N) with a desired margin of error (e). It is particularly useful when the population variance is unknown and a simple random sampling method is intended.

$n = N / (1 + N * e^2)$

Where:

- n = required sample size
- N = total population size
- e = margin of error (expressed as a decimal)

For this study, a slightly adjusted total population size of 6,060 households will be used, with a margin of error of 5% (0.05).

$n = 6060 / (1 + (6060 \times 0.05^2))$

$n = 6060 / (1 + (6060 \times 0.0025))$

$n = 6060 / (1 + 15.15)$

$n = 6060 / 16.15 \approx 306$

Thus, the total sample size will be 306 households, divided equally between poultry farmers and non-farmers. This balanced allocation will enable an effective comparison of welfare outcomes between the two groups. The final sample will be proportionally selected from each stratum based on its share in the adjusted population.

3.5 Data Collection Tools

To comprehensively investigate the socioeconomic and nutritional impacts of urban poultry farming in Shire Town, a combination of quantitative and qualitative data collection tools was employed. These tools were carefully designed and pre-tested to ensure clarity, relevance, and cultural appropriateness, thereby enhancing the reliability and validity of the data collected.

3.5.1 Questionnaire

The primary quantitative data collection instrument was a structured questionnaire, developed to capture a wide range of information relevant to the study objectives. The questionnaire was divided into several sections, each focusing on key variables:

Demographic Information: Collected data on household size, age, gender, education levels, and occupation of household members, enabling analysis of socio-demographic factors influencing poultry farming practices and household wellbeing.

Economic Indicators: Included questions on sources of household income, poultry farming activities (e.g., type and number of birds), expenditures, and income derived from poultry products. This section helped quantify the financial contribution of poultry farming to household livelihoods.

Nutritional Indicators: Gathered information on dietary patterns, frequency of poultry product consumption (eggs and meat), and household food security status. The data allowed assessment of the nutritional benefits associated with access to poultry products.

Health and Education Outcomes: Included questions on healthcare expenditures, incidence of common illnesses, school attendance, and educational expenditures, to explore indirect effects of poultry income on household welfare.

The questionnaire was administered face-to-face by trained enumerators fluent in the local language, ensuring accurate data collection and clarifying any respondent queries. A pilot test was conducted before the main survey to refine question phrasing and sequencing.

3.5.2 Interviews

To complement the quantitative data, semi-structured interviews were conducted with selected key informants who possessed specialized knowledge of urban poultry farming. The interview guides were designed to explore:

- Institutional support systems such as agricultural extension services and market facilitation.
- Perceived challenges and opportunities in urban poultry production.
- Policy and regulatory frameworks affecting urban livestock keeping.

Social dynamics within poultry farming communities, including gender roles and youth participation.

The semi-structured format allowed flexibility for interviewees to provide detailed responses and share experiences beyond the fixed questions, enriching the study's contextual understanding.

3.6 Variables and Indicators

3.6.1 Economic Indicators

Economic indicators are critical in assessing the financial contribution of urban poultry farming to household livelihoods. This study evaluates several key economic variables

to understand how poultry production affects income generation, expenditure patterns, and household resilience.

a) Household Income

This refers to the total earnings accrued by the household from various sources, including but not limited to poultry farming. It includes:

- Poultry-related income: Revenues from selling eggs, live birds, manure, and poultry products.
- Non-poultry income: Wages, salaries, petty trade, remittances, and other business activities.

Measurement: Monthly income in Ethiopian Birr (ETB) from each source, allowing comparison between poultry and non-poultry households.

b) Household Expenditure

Captures the patterns and priorities of household spending, especially how income from poultry contributes to key needs such as:

Food purchases, Education (e.g., school fees, uniforms, books),

Healthcare (e.g., medical bills, medication), Housing and utilities, Savings and reinvestment in poultry activities

Measurement: Self-reported average monthly expenditure by category, used to assess whether poultry farming enables greater financial capacity for basic needs.

c) Poultry Production Levels

Provides a direct economic measure of engagement in urban poultry farming and its productivity. Key sub-indicators include:

- Number of birds owned (categorized by breed: local, hybrid, exotic), birds sold per month, Poultry product consumption versus market sale ratio,
- Frequency and seasonality of production

Measurement: Quantitative records from household surveys; analyzed to determine the scale of poultry activity and its correlation with economic outcomes.

d) Access to Inputs and Credit

Access to productive inputs (feed, vaccines, housing materials) and credit significantly influences economic outcomes. Access to loans or grants for poultry investment, Availability and affordability of poultry feed, and veterinary services

Measurement: Binary (Yes/No) and Likert-scale responses regarding ease of access, source of credit, and frequency of input purchases.

e) Market Participation

Market access determines income-generating potential from poultry products,
Frequency of selling products, Bargaining power, and price satisfaction
Measurement: Categorical and open-ended responses on where, how, and how often products are sold, plus qualitative perceptions of profitability.

3.6.2 Nutritional Indicators

The nutritional indicators were designed to assess the dietary quality and food security status of households, with a particular focus on the role of poultry farming in enhancing nutrition. Key variables included:

- Dietary Diversity Scores (DDS): This indicator measured the variety of food groups consumed by household members over a specified recall period, typically 24 hours or seven days. Dietary diversity serves as a proxy for nutrient adequacy and overall diet quality. Households were asked to report the consumption of different food categories such as cereals, legumes, vegetables, fruits, dairy, meat, and eggs. A higher DDS indicates better access to diverse and balanced diets.
- Frequency of Poultry Consumption: Specific questions captured how often households consumed poultry products such as eggs and meat. Frequency was categorized by daily, weekly, monthly, or rarely/never consumption. This helped quantify the contribution of home-produced poultry to regular protein intake.

Food Security Status: Additional questions assessed household food security through indicators such as meal skipping, food shortage experiences, and reliance on purchased versus home-produced food items. These data provided insight into the extent to which poultry farming mitigates food insecurity risks.
Collecting these nutritional indicators allowed the study to link poultry farming practices with measurable improvements in household diet quality and nutritional outcomes.

3.6.3 Health Indicators

Health indicators were included to evaluate how income and nutrition from poultry farming potentially influence household health status and healthcare access. The variables measured were:

- Access to Healthcare Services: Respondents were asked about their proximity to health facilities, frequency of healthcare visits, availability of essential medicines, and affordability of medical treatment. These data helped assess whether poultry-related income facilitated better healthcare access.

Health Expenditures: Information was collected on healthcare spending to understand economic burdens and how poultry farming income might offset medical costs.

These indicators helped reveal potential indirect health benefits of poultry farming through improved nutrition and increased financial capacity to seek healthcare.

3.6.4 Educational Indicators

Educational indicators focused on how urban poultry farming contributes to human capital development within households. Key elements included:

- School Enrollment Rates: Data were gathered on the number of school-aged children currently enrolled in formal education within the household, including distinctions between primary, secondary, and higher education. This helped evaluate whether poultry farming income supports sustained school attendance.
- Educational Expenditures: Respondents reported annual or monthly spending on school fees, uniforms, supplies, and related expenses. These data illuminated the financial contribution of poultry farming towards educational investments.

By examining these educational indicators, the study aimed to assess whether income and food security improvements linked to poultry farming translate into better educational opportunities and outcomes for children.

3.7 Data Analysis Techniques

To rigorously evaluate the socioeconomic and nutritional impacts of urban poultry farming in Shire Town, this study employed both quantitative and qualitative data analysis techniques. The integration of these methods allowed for robust comparisons between poultry-farming and non-farming households, identification of key determinants, and in-depth understanding of community experiences.

3.7.1 Propensity Score Matching (PSM)

Propensity Score Matching (PSM) was applied to estimate the causal impact of poultry farming on various outcome variables such as household income, dietary diversity, and educational expenditure. Given the non-randomized nature of household participation in poultry farming, PSM helps to reduce selection bias by creating a counterfactual comparison group.

Approach: The probability (propensity score) of a household engaging in poultry farming was estimated using observed covariates such as household size, education level of the head, land ownership, access to credit, and employment status.

Matching Technique: Nearest-neighbor matching was used to pair each poultry-farming household with a non-farming household having a similar propensity score.

Outcome Analysis: Average Treatment Effect on the Treated (ATT) was computed to determine the differential impact of poultry farming on key economic and nutritional indicators.

Justification: PSM is particularly appropriate for quasi-experimental studies where randomized controlled trials are not feasible, making it ideal for policy-relevant comparisons.

3.7.2 Econometric Model: Logit Regression

The logistic regression modeling approach is used when the response variable is qualitative in nature or categorical, and the independent variables may be either continuous or categorical. Binary logistic regression is a form of logistic regression that is used when the dependent variable is dichotomous and the independent variables are of any type (Hosmer et al., 1997). Logistic regression is based on the logit transformation of the dependent variable. The logit transformation generates a continuous logarithmic curve from non-continuous data so that a regression model can be developed. Predictions made by linear regression are based on the observed changes in the independent data itself, but logistic regression is based on the log of the odds of a particular event occurring with a given set of observations.

To derive the logit regression formula, start with the concept of modeling a binary outcome variable. $Y = 1$ represents the occurrence of an event yes and $Y = 0$ represents the non-occurrence no. The goal is to model the probability that $Y = 1$ given a set of predictor variables.

Step 1: Define the Probability

Let $P(Y = 1 \mid X)$ be the probability that $Y = 1$ given the predictors $X = (X_1, X_2, \ldots, X_k)$.

$P = P(Y = 1 \mid X)$

Step 2: Log-Odds Transformation

Instead of modeling P directly, model the odds of the event occurring. The odds are defined :Odds = P / 1 - P

Next, take the natural logarithm of the odds to obtain the log-odds (or logit):logit(P) = \logP / 1 - P

Step 3: Linear Relationship

Assume the log-odds can be expressed as a linear combination of the predictor variables:$\text{logit}(P) = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \ldots + \beta_k X_k$

Where:

- β_0 is the intercept.
- $\beta_1, \beta_2, \ldots, \beta_k$ are the coefficients corresponding to each predictor variable.

Step 4: Expressing Probability in Terms of Predictors

Now, express P in terms of the predictors by rearranging the equation:

1. Start with the logit equation:\logP / 1 - P = $\beta_0 + \beta_1 X_1 + \beta_2 X_2 + \ldots + \beta_k X_k$
2. Exponentiate both sides:P / 1 - P = e^($\beta_0 + \beta_1 X_1 + \beta_2 X_2 + \ldots + \beta_k X_k$)
3. Rearranging gives:P = e^($\beta_0 + \beta_1 X_1 + \beta_2 X_2 + \ldots + \beta_k X_k$) (1 - P)
4. Multiply both sides by $(1 - P)$:P(1 - P) = e^($\beta_0 + \beta_1 X_1 + \beta_2 X_2 + \ldots + \beta_k X_k$)
5. Rearranging leads us to:

$P = e^{(\beta_0 + \beta_1 X_1 + \beta_2 X_2 + \ldots + \beta_k X_k)} / 1 + e^{(\beta_0 + \beta_1 X_1 + \beta_2 X_2 + \ldots + \beta_k X_k)}$

Final Logit Regression Formula

Thus, the final formula for the probability that $Y = 1$ given predictors $X_1, X_2, \ldots, X_k$ in a logit regression model is:

$P(Y = 1 \mid X) = 1 / 1 + e^{(-(\beta_0 + \beta_1 X_1 + \beta_2 X_2 + \ldots + \beta_k X_k)}$

This logistic function maps any real-valued number into the range (0, 1), which is suitable for modeling probabilities.

3.8 Ethical Considerations

Ethical integrity was a central concern throughout the research process to ensure the protection, dignity, and rights of all participants involved in the study. The research adhered to ethical standards in social science research and complied with the institutional and national guidelines for conducting research involving human subjects.

3.8.1 Informed Consent

Before participation, all respondents were provided with clear and comprehensive information about the purpose, scope, and procedures of the study. The following steps were taken to ensure informed consent:

Voluntary Participation: Respondents were informed that their participation was entirely voluntary and that they could withdraw at any point without any negative consequences.

Explanation of Purpose: The research objectives, potential benefits, and any foreseeable risks were explained in a language understandable to the participants.

Consent Documentation: A written or verbal informed consent was obtained from each participant before data collection commenced (see Appendix C for sample consent form).

Special Groups: For participants who were minors (under 18) or who had limited literacy, consent was obtained through a guardian or read aloud in their preferred language.

This process ensured that participants entered the study with full knowledge and autonomy.

3.8.2 Confidentiality

To protect participants' privacy and ensure the confidentiality of the data collected, several measures were taken:

Anonymization of Data: Names, addresses, and any other personal identifiers were not recorded or were replaced with unique codes during data entry and analysis.

Secure Data Storage: All physical questionnaires were stored in a locked location, and electronic data were password-protected and accessible only to the principal investigator and authorized research assistants.

Reporting: In all reporting and dissemination of findings, data were presented in aggregate form so that no individual respondent could be identified.

Confidential Interview Environment: Interviews and focus group discussions were conducted in settings that allowed for privacy and comfort to encourage honest and open responses.

These confidentiality practices were designed to build trust with respondents and ensure the ethical handling of sensitive information.

3.8.3 Ethical Clearance

The study protocol, including the data collection tools and informed consent procedures, was reviewed and approved by the Research Ethics Committee of [Your Institution] before data collection. Ethical clearance ensured that the study met national and institutional standards for the protection of human subjects in research.

In sum, the study upheld rigorous ethical standards by ensuring informed consent, maintaining confidentiality, and securing ethical clearance. These measures helped safeguard the rights and well-being of participants while enhancing the credibility and integrity of the research findings.

Chapter Four

Results and Discussions

4.1. Household demographics

Table 1: House Demographics

Variable	Category	Frequency	Percent (%)
Sex	Female	105	34.31
	Male	201	65.69
	Total	306	100
Relationship to HH Head	Father/Mother	8	2.61
	Grandchild	2	0.65
	Household Head	271	88.56
	Non-relative	7	2.29
	Other relative	7	2.29
	Son/Daughter	9	2.94
	Spouse	2	0.65
	Total	306	100
Marital Status	Divorced / Separated	48	15.69
	Married / Living together	203	66.34

	Single / Never Married	26	8.5
	Widowed	29	9.48
	Total	306	100
Education Level (educ)	Diploma	21	6.9
	Bachelor's Degree	34	11.1
	Informal/Religious education only	54	17.6
	Master's Degree	6	2
	No formal education	58	19
	PhD	1	0.3
	Primary School (Grade –)	83	27.1
	Secondary School (Grade –)	37	12.1
	TVET/Vocational Training	12	3.9
	Total	306	100
Occupation (occu)	Unemployed / Seeking work	2	0.7
	Crop farming	4	1.3
	Poultry farming	5	1.6
	Self-employed (Non-agricultural business)	223	72.9
	Wage/Salaried (Government/Public sector)	47	15.4
	Wage/Salaried (Private sector)	25	8.2
	Total	306	100
Other Income Sources	Other	25	8.17
	Pensioner	5	1.63
	Poultry farming	2	0.65
	Total	306	100

Source: own survey

Table 1 presented above illustrates the socio-demographic and occupational characteristics of the 306 respondents who participated in the study titled "Investigating the Impacts of Urban Poultry Farming on Household Welfare using Propensity Score Matching Technique: A Case Study of Shire Town in Northern Tigray Region, Ethiopia." This descriptive summary provides essential context for understanding the composition of the sample population and serves as a foundation for interpreting the subsequent statistical analyses, particularly those related to household welfare outcomes.

To begin with, the distribution of respondents by sex reveals a pronounced gender imbalance. Specifically, out of the total sample, 201 individuals (65.69%) were male, while 105 (34.31%) were female. This indicates a clear male predominance in the survey data, which may reflect broader societal patterns in household leadership, land ownership, or access to economic opportunities in the region. Given that household heads are often male in many Ethiopian urban and peri-urban settings, this distribution is not unexpected. However, it also suggests that the perspectives and welfare

experiences of female-headed households—often more vulnerable to economic shocks—may be underrepresented, which could influence the external validity of the findings.

Furthermore, the data on relationship to the household head underscores a strong concentration of decision-making authority among primary household members. A remarkable 271 respondents (88.56%) identified themselves as the household head, indicating that the majority of responses were provided by individuals directly responsible for key household decisions, including those related to income generation, expenditure, and agricultural activities. The remaining respondents included sons or daughters (2.94%), other relatives (2.29%), non-relatives (2.29%), parents of the head (2.61%), spouses (0.65%), and grandchildren (0.65%). This overwhelming dominance of household heads enhances the reliability of self-reported welfare indicators but limits insights into intra-household dynamics, particularly the roles and contributions of women and children.

Regarding marital status, the majority of respondents were married or living together (66.34%), reflecting a social structure centered on stable, co-residential unions that may facilitate joint economic decision-making and labor pooling. A significant proportion were divorced or separated (15.69%), while widowed (9.48%) and single/never married (8.50%) individuals constituted smaller shares. The relatively high percentage of divorced or widowed individuals may point to underlying vulnerabilities, particularly in terms of household stability and access to support networks. These marital dynamics are relevant to understanding household resilience and the potential role of urban poultry farming as a coping or income-generating strategy among different household types.

The educational attainment of respondents presents a diverse yet generally low-to-moderate level of formal schooling. The largest single group had completed Primary School (27.1%), followed by those with no formal education (19.0%) and Informal or Religious education only (17.6%). At higher levels, 34 respondents (11.1%) held a Bachelor's Degree, 6 (2.0%) a Master's Degree, and only 1 individual (0.3%) possessed a PhD. Additionally, 21 (6.9%) held a Diploma, and 12 (3.9%) had undergone TVET/Vocational Training. These figures indicate that while a segment of the population is highly educated—possibly reflecting the presence of civil servants, teachers, or returnees—nearly half of all respondents (43.7%) had attained only primary education or less. This mixed educational profile suggests varied capacities for

accessing, understanding, and applying technical knowledge related to modern poultry practices, which may affect adoption rates and productivity outcomes.

In terms of main occupation, the distribution is heavily skewed toward self-employment in non-agricultural sectors. A substantial 223 respondents (72.9%) reported being self-employed in non-agricultural business or trade, indicating a vibrant informal economy and a strong reliance on small-scale entrepreneurship for livelihoods. This is followed by 47 individuals (15.4%) engaged in wage/salaried employment in the public sector, and 25 (8.2%) in the private sector. Agricultural activities are far less dominant: 4 respondents (1.3%) listed crop farming as their main occupation, while only 5 (1.6%) reported poultry farming as their primary source of income. Merely 2 individuals (0.7%) were unemployed. The minimal representation of poultry farming as a main occupation strongly suggests that it is largely practiced as a subsidiary or supplementary activity, rather than a primary livelihood strategy. This implies that its contribution to household income may be indirect or marginal, with greater significance possibly lying in food security, nutrition, or risk diversification rather than commercial profit.

Additional income sources further reinforce this interpretation. Only 2 respondents (0.65%) listed poultry farming as an additional source of income, while 25 (8.17%) reported other unspecified sources and 5 (1.63%) received pensions. These patterns highlight the multifaceted nature of urban livelihoods, where households often combine multiple small-scale income streams to ensure economic stability.

In summary, the socio-demographic profile of the respondents reveals a population that is predominantly male, overwhelmingly composed of household heads, mostly married, and engaged primarily in non-agricultural self-employment. Educational attainment is varied, with a notable portion having limited formal education, while a smaller but significant group possesses tertiary qualifications. Crucially, urban poultry farming is not a dominant occupation, with only a small fraction of respondents relying on it as their main livelihood.

These characteristics are critical for contextualizing the findings of the propensity score matching analysis. They suggest that the welfare impacts of urban poultry farming may be subtle, indirect, or context-specific—mediated by household structure, education, and existing economic activities. As such, policies aiming to promote urban poultry farming should consider these socio-demographic realities, particularly the need for targeted support to women, less-educated households, and those with limited access to capital or technical knowledge.

Table 2:Descriptive statistics for numerical variables

Variable	Obs	Mean	Std. Dev.	Min	Max
total_hh_members	306	4.68	1.36	0	8
children_lt5	306	0.96	1.86	0	13
children_6_14	306	1.49	0.75	0	3
adults_15_64	306	1.96	0.64	0	5
elderly_gt65	306	0.41	0.61	0	2

Source: own survey

Table 2 provides descriptive statistics for key household composition variables collected through Section B2 of the household survey, titled "Household Composition Summary." These variables capture the number of individuals in different age cohorts within each household and are essential for understanding the demographic structure that potentially shapes household welfare outcomes in the context of urban poultry farming in Shire Town, Northern Tigray.

Starting with the total number of household members, the mean household size is 4.68 persons, with a standard deviation of 1.36. The values range from a minimum of 0 to a maximum of 8. While a mean close to five suggests a moderate household size consistent with national urban household averages, the presence of households recorded as having zero members is not logically coherent in this context. This likely reflects either a data entry error or misinterpretation during data collection, possibly when enumerators left the field blank or coded it incorrectly for unoccupied dwellings. Excluding such anomalies, the distribution suggests that the sample is largely composed of medium-sized families, which may have implications for resource needs, food consumption, and labor availability—all central to evaluating the effects of poultry farming on household welfare.

Looking more closely at the child population, the average number of children under the age of five (*children_lt5*) is 0.96, with a relatively high standard deviation of 1.86. While the mean indicates that many households have at least one young child, the maximum value of 31 is implausible given standard fertility patterns and household sizes. This again likely represents a data entry error, possibly due to misplaced values or confusion during recording. Such extreme values should be treated cautiously or cleaned before further analysis. Notwithstanding the outlier, the presence of young children in a household may have substantial welfare implications, particularly to nutritional needs, child care responsibilities, and health expenditures.

For the school-age population (*children aged 6–14*), the mean is 1.49 children per household, with a standard deviation of 0.75. The values range from 0 to 3, which appears consistent with plausible family structures in the urban Ethiopian context. This category represents a critical segment of the dependent population, whose educational needs and associated costs—captured in Section H of the survey—are important welfare indicators. The relatively low variability suggests a stable demographic pattern in this age group across the sample.

The number of working-age adults (*adults aged 15–64*) averages at 1.96 per household, with a standard deviation of 0.64. The minimum value is 0 and the maximum is 5. These figures suggest that most households contain at least one or two economically active members, which is significant for understanding labor availability for livelihood activities such as poultry farming. The presence of multiple working-age adults may contribute to greater income diversification, enhanced resilience to shocks, and improved welfare outcomes. Conversely, households with no adults in this age range may be more vulnerable and dependent, potentially limiting their ability to participate in labor-intensive economic activities.

Finally, the elderly population (*individuals aged 65 and above*) has a mean value of 0.41 and a standard deviation of 0.61, with household counts ranging from 0 to 2. This indicates that most households do not include elderly members, although a minority does. Given the increased care needs and reduced labor contributions associated with older age, households with elderly members may face unique welfare challenges, especially in the absence of strong social support systems.

In sum, the household composition statistics paint a picture of moderately sized families with a mix of dependents and economically active members. However, the presence of implausible values—such as a household size of zero and 13 children under five—highlights the need for data cleaning before proceeding with further econometric analysis. These demographic variables are not merely descriptive; they are fundamental covariates in propensity score matching and must be handled with care to ensure valid estimation of the welfare impacts of urban poultry farming.

4.2. Housing/assets

Table 3:Housing/ assets

Variable	Category	Freq	Percent
Floor Material	Cement	228	74.51%

	Earth/Sand	70	22.88%
	Tile	4	1.31%
	Other	4	1.31%
	Total	306	100%
Wall Material	Cement	155	50.65%
	Brick	106	34.64%
	Mud	45	14.71%
	Total	306	100%
Roof Material	Corrugated Iron Sheet	203	66.34%
	Concrete	74	24.18%
	Thatched	25	8.17%
	Other	4	1.31%
	Total	306	100%
Toilet Facility	Pit latrine	265	86.60%
	No facility	22	7.19%
	Shared latrine	5	1.63%
	Flush toilet	14	4.58%
	Total	306	100%
Drinking Water Source	Other	214	69.93%
	Private tap	86	28.10%
	Public tap	5	1.63%
	Borehole	1	0.33%
	Total	306	100%

Source: own survey

Variable	Obs	Mean	Std. Dev.	Min	Max
Number of rooms	306	2.48	1.14	0	7

Table 3 offers a descriptive overview of the housing conditions of the surveyed households in Shire Town. These indicators—collected in Section C1 of the survey instrument—reflect the material quality of housing structures, sanitation facilities, water access, and household size in terms of the number of rooms. As such, they serve as critical proxies for assessing the physical dimension of household welfare. Understanding these conditions is particularly important when analyzing the impact of urban poultry farming, since the physical environment in which households live can either constrain or facilitate productive livelihood activities.

Starting with floor materials, the data show that a significant majority of respondents (74.51%) reside in homes with cement flooring. This is often associated with improved living standards, as cement floors are more durable, cleaner, and less susceptible to disease vectors compared to more rudimentary surfaces. By contrast, 22.88% of households reported earth or sand floors—materials typically associated with lower-income or more traditional housing structures. A small fraction of households (1.31%

each) had tiled floors or other unspecified materials. The high prevalence of cement flooring suggests that a majority of the sample lives in relatively well-constructed dwellings, though a notable segment continues to live in more basic conditions.

When turning to wall materials, the data reveal a more mixed picture. Cement walls were reported by 50.65% of households, indicating a considerable proportion of structurally sound housing. Brick walls accounted for 34.64%, and mud walls for 14.71%. Mud construction, often associated with informal or older housing, can be less durable and more vulnerable to environmental degradation. The distribution of wall types indicates that while many households reside in homes made with more permanent materials, a substantial number still rely on less durable options. This variation in wall quality may correlate with differing levels of asset ownership, security, and resilience to external shocks.

Roofing material offers additional insight into housing quality. The most common roofing type was corrugated iron sheets, reported by 66.34% of households. While this is a typical and affordable roofing material in both rural and urban Ethiopia, it may not offer the same level of insulation or durability as concrete roofs, which were used by 24.18% of respondents. Thatched roofs—generally considered less durable and more vulnerable to weather-related damage—were reported by 8.17% of households. The remaining 1.31% reported other roofing types. These findings suggest that while the majority of homes in Shire Town have standard roofing, a minority still live under relatively fragile conditions, potentially limiting their ability to invest in or expand poultry-related infrastructure.

Regarding sanitation, the data reveal that pit latrines are by far the most common type of toilet facility, used by 86.60% of the sample. While pit latrines can be considered improved sanitation when well-constructed, they still pose hygiene risks if not maintained properly. A concerning 7.19% of households reported having no toilet facility at all, which raises serious public health concerns. Only a small proportion of households had access to flush toilets (4.58%) or shared latrines (1.63%), both of which are generally considered more advanced forms of sanitation. These results indicate a generally low level of sanitation infrastructure, which could have significant implications for household health and, by extension, labor productivity and household welfare.

Access to drinking water also reveals a pattern of infrastructural limitation. The majority of households (69.93%) obtained their drinking water from sources

categorized as "Other," which—though unspecified—may include river water, vendors, or informal taps. This category lacks specificity but is typically associated with unreliable or unimproved water sources. Only 28.10% of households had access to a private tap, which is a strong indicator of improved water access. Public taps and boreholes were reported by only 1.63% and 0.33% of respondents, respectively. This pattern suggests that many households may face daily challenges in accessing clean and safe drinking water, a factor that may directly impact their overall welfare and capacity to engage in additional livelihood activities such as poultry production.

Lastly, the number of rooms in the household, a continuous variable, provides a more quantitative measure of housing size and space availability. On average, households reported having 2.48 rooms, with a standard deviation of 1.14. The number of rooms ranged from 0 to 7, where a value of zero may again reflect a data entry error or could possibly indicate households living in single-roomed dwellings that were improperly coded. The mean number of rooms suggests that most households have access to at least two rooms, which may provide adequate space for both living and income-generating activities, including the rearing of poultry in small-scale urban settings. Nevertheless, the relatively low average also indicates spatial limitations, which may constrain the type and scale of poultry production households can realistically undertake.

In summary, the housing and asset data paint a picture of moderate material well-being among the study population. While a majority of households live in structures with cement floors, durable walls, and corrugated roofs, a significant portion still lacks access to high-quality sanitation and reliable water sources. These disparities are important to acknowledge, as they may shape not only the baseline level of household welfare but also the ability of households to benefit from or participate in urban poultry farming. The findings underscore the necessity of considering housing infrastructure as a mediating factor in any assessment of welfare outcomes associated with livelihood interventions.

4.3. Consumption/expenditure

Table 4:Consumption/expenditure

Expenditure Category	Type	Obs	Mean (ETB)	Std. Dev. (ETB)	Min (ETB)	Max (ETB)
Rent	Monthly	306	2,110.58	1,452.42	0	10,000

Utilities (electricity, water, etc.)	Monthly	306	1,007.49	897.4	0	9,520
Transport	Monthly	306	598.26	722.35	0	6,800
Health	Annual	306	866.17	976.17	0	8,690
Education	Annual	306	985.25	991.45	0	4,500
Clothing & Shoes	Annual	306	1,105.59	1,191.69	0	10,000
Communication (airtime, internet)	Annual	306	435.4	384.17	0	3,000
Furniture & Appliances	Annual	306	390.64	967.74	0	10,000
Ceremonial (weddings, funerals, etc.)	Annual	306	639.35	603.62	0	4,000
Agricultural Inputs	Annual	306	381.53	726.4	0	7,000
Repairs & Renovations (home, tools)	Annual	306	365.29	691.71	0	6,000
Taxes & Fees (licenses, permits, etc.)	Annual	306	3,215.32	5,347.84	0	24,800

Source: own survey

This section presents detailed data on household consumption and non-food expenditure patterns, based on responses to Section D2 of the Household Survey Questionnaire. The data are crucial in assessing the economic welfare and living standards of households in Shire Town, especially in the context of evaluating the impact of urban poultry farming. Both monthly and annual expenditures are covered, reflecting different frequencies of household spending. All values are expressed in Ethiopian Birr (ETB).

Starting with monthly rent expenditures, the average household spends approximately 2,110.58 ETB per month, with a relatively high standard deviation of 1,452.42 ETB, indicating significant variability across households. The minimum recorded value is 0 ETB, suggesting that some households either own their homes or live in dwellings without formal rental payments—possibly through family arrangements or informal housing. The maximum of 10,000 ETB highlights the presence of high-cost rental dwellings, perhaps associated with households in more developed or central urban areas. This variability in housing costs reflects socioeconomic diversity within the sample.

Monthly utility expenditures, which include electricity and water services, average 1,007.49 ETB, with a standard deviation of 897.40 ETB. This again suggests substantial differences in service access and consumption. Households reporting zero utility expenditures may lack access to these services altogether or may share facilities with others, leading to cost-sharing or indirect payment mechanisms. On the upper end, households spending close to 9,520 ETB monthly likely consume above-average volumes of electricity or water, possibly due to business use or larger household sizes.

Transport expenditures, also recorded monthly, average 598.26 ETB. The standard deviation of 722.35 ETB indicates a fairly wide distribution. Transportation is a critical expense for urban households, especially for those engaged in employment or income-generating activities outside the home. Variations in this category may relate to occupational type, distance from economic centers, or access to public transport. Some households incur no transport costs, possibly due to walking distances or remote work arrangements.

Moving to annual expenditures, health-related spending averages 866.17 ETB, with a standard deviation of 976.17 ETB. The wide range (from 0 to 8,690 ETB) suggests that while many households incur minimal health costs, others face significant medical expenses, likely due to chronic illness, emergencies, or the need for specialized care. This category is vital in evaluating vulnerability, as unexpected health costs can drastically affect household welfare, particularly for low-income families.

Education expenses, averaging 985.25 ETB per year, include school fees, uniforms, and materials for school-aged children, as outlined in Section H of the questionnaire. The relatively low average is consistent with public education systems but the variability suggests that some households use private schooling or incur supplementary costs. A zero-expenditure response may indicate the absence of school-aged children in the household or non-enrollment due to barriers like cost, distance, or disinterest.

In terms of clothing and footwear, households spend an average of 1,105.59 ETB annually. Clothing expenditures, although not strictly essential in economic models, are a reflection of basic living standards and social participation. The standard deviation of over 1,191 ETB and a maximum of 10,000 ETB point to significant variation in clothing consumption, which may reflect income differences, household size, or cultural practices.

Communication expenses, including mobile airtime and internet, average 435.40 ETB per year. Given the increasing reliance on digital connectivity even in urban low-income areas, this moderate average likely reflects mobile phone usage rather than internet services, which remain less accessible or affordable for many households.

Expenditures on furniture and appliances are reported at a mean of 390.64 ETB annually, with a high standard deviation of 967.74 ETB. These are typically non-regular, capital expenses, incurred when replacing or upgrading household assets. The wide dispersion and maximum value of 10,000 ETB reflect the episodic nature of such purchases, which can significantly improve household living conditions.

Ceremonial expenses, which include social obligations such as weddings, funerals, and religious events, average 639.35 ETB annually. These expenditures are deeply embedded in Ethiopian cultural life and are often undertaken even by lower-income households. The wide variation suggests that while some households prioritize or are obligated to spend heavily on ceremonies, others do so less frequently or not at all.

Spending on agricultural inputs—despite the urban focus of the study—averages 381.53 ETB. This indicates that a subset of households engages in small-scale urban or peri-urban farming activities, including crop production or mixed livestock rearing. Though poultry-specific input costs may also be embedded here, the relatively low average suggests limited engagement at scale.

Home repairs and tool renovations average 365.29 ETB annually, with a high variation. Such spending reflects investments in maintaining the functionality and value of household assets. The expenditure likely varies by the age of the dwelling, income availability, and perceived necessity.

Finally, taxes and fees, including payments for licenses, business permits, and other formal sector requirements, present the highest average annual expenditure at 3,215.32 ETB, with a substantial standard deviation of 5,347.84 ETB and a maximum of 24,800 ETB. This pattern suggests that a portion of households—possibly those engaged in formal employment, operating businesses, or owning property—are contributing significantly to municipal or national tax systems, while others pay none at all.

In conclusion, these expenditure patterns demonstrate considerable heterogeneity in household financial behavior across essential services, welfare-related investments, and discretionary spending. These differences are vital to consider when assessing household welfare outcomes and the role of urban poultry farming, as financial capacity and consumption behavior can influence both participation in poultry activities and the potential benefits derived from them. Thus, these expenditure metrics serve as critical control variables in the Propensity Score Matching (PSM) analysis used later in this study.

4.4. Poultry farming

Table 5:Poultry farming

Variable	Category	Freq	Percent
Owns Poultry (Full Sample)	No	178	58.17%
	Yes	128	41.83%

	Total	306	100%
Production System	Backyard	106	82.81%
	Semi-intensive	1	0.78%
	Intensive	21	16.41%
	Total	128	100%
Sells Poultry	No	3	2.34%
	Yes	125	97.66%
	Total	128	100%
Main Purpose of Poultry Farming	Both (consumption & income)	108	84.38%
	Income generation only	18	14.06%
	Household consumption only	2	1.56%
	Total	128	100%
Received Extension Training	No	37	28.91%
	Yes	91	71.09%
	Total	128	100%
Accessed Loan/Credit for Poultry	No	76	59.38%
	Yes	52	40.63%
	Total	128	100%

Source: own survey

The data presented in Table 5: Poultry Farming provides valuable insights into the nature, scale, and support systems associated with urban poultry farming among households in Shire Town. This section directly relates to the core objective of the study—assessing the impact of urban poultry farming on household welfare using the Propensity Score Matching (PSM) technique. The variables summarized here are derived from Section E of the household questionnaire, which specifically investigates poultry ownership, production systems, marketing behavior, training access, and financial support. These variables not only describe the characteristics of poultry-farming households but also help identify heterogeneity in their engagement, intensity, and motivations.

Starting with poultry ownership, the data reveal that out of the 306 surveyed households, 128 households (41.83%) reported owning poultry, while the majority—178 households (58.17%)—did not. This proportion underscores the relevance of poultry farming as a prominent, though not universal, livelihood strategy in the urban context of Shire Town. The relatively high share of non-owners provides an appropriate control group for comparison in the PSM analysis, while the significant portion of poultry-keeping households allows for meaningful investigation into potential welfare differences.

Among those who engage in poultry farming (n = 128), the overwhelming majority—106 households (82.81%)—utilize a backyard production system. This system typically involves low-input, small-scale, and low-technology poultry keeping, often integrated into household compounds. The reliance on backyard systems indicates that poultry farming is primarily a supplementary livelihood activity rather than a fully commercial enterprise for most households. Only 21 households (16.41%) operate intensive production systems, and a single household (0.78%) reported using a semi-intensive system. Intensive systems usually involve higher capital investment, specialized housing, regular feeding, and veterinary services, suggesting that a minority of households have both the resources and market orientation to engage in poultry farming at a more commercial scale.

In terms of market engagement, the data show a remarkably high degree of commercialization among poultry-farming households. A total of 125 households (97.66%) reported that they sell poultry or poultry products, while only 3 households (2.34%) do not engage in sales. This strong market orientation indicates that for most participants, poultry farming is not merely for subsistence or household food security, but is instead viewed as a viable income-generating activity. This commercialization may also reflect the growing demand for poultry products in urban areas, making poultry a relatively accessible and profitable enterprise for low- to middle-income households.

Regarding the primary purpose of poultry farming, the majority—108 households (84.38%)—identified both income generation and household consumption as their main motivation. This dual-purpose approach is typical in urban settings, where poultry products such as eggs and meat contribute to dietary diversity and nutrition, while surplus production is monetized. Another 18 households (14.06%) reported income generation only as their objective, indicating a more business-oriented approach. Only 2 households (1.56%) raise poultry solely for household consumption. This distribution aligns with earlier findings on the commercial nature of poultry farming in the town, while also highlighting the importance of poultry as a nutritional resource for many households.

The next variable assesses whether poultry farmers received any extension training or support services, which are often essential for improving productivity and profitability. According to the data, 91 households (71.09%) reported having received some form of extension training, while 37 households (28.91%) had not. This high level of training

access suggests the presence of institutional support, possibly from government agricultural offices, NGOs, or local cooperatives. Training may cover technical areas such as disease management, feeding practices, and marketing strategies, which are crucial for enhancing the efficiency of poultry farming. The presence of a substantial untrained group, however, indicates that access to such services is not universal and may affect productivity and outcomes.

Lastly, in terms of access to financial services, 52 households (40.63%) reported having accessed loan or credit facilities specifically to support their poultry business, while the remaining 76 households (59.38%) had not. This finding points to both opportunities and constraints: while nearly 41% of poultry producers have been able to mobilize financial resources—likely for expanding operations or purchasing inputs—more than half operate without formal financial backing. The limited access to credit may reflect structural barriers such as lack of collateral, financial literacy, or availability of poultry-specific credit products in urban areas.

In summary, the descriptive statistics on poultry farming illustrate that it is a significant livelihood activity in Shire Town, practiced by over 40% of households, most of whom combine production for both consumption and market. The dominance of backyard systems suggests a largely small-scale sector, yet one that is highly commercialized. Access to extension training is widespread but not universal, and financial constraints remain for a large portion of participants. These characteristics are important to consider when analyzing the causal impact of poultry farming on household welfare, as variation in production systems, training access, and financial capital may mediate the outcomes observed. Therefore, these variables should be carefully included in matching procedures and interpreted within the broader socioeconomic and institutional context of the town.

Table 6:Descriptive statistics of poultry farming

Variable	Obs	Mean	Std. Dev.	Min	Max
Number of Poultry Birds	128	14.59	106.79	1	1,213
Rearing/Selling Cycle (Days)	128	49.68	44.66	7	300
Monthly Income from Poultry (ETB)	128	5,546.94	4,790.78	2	19,000

Source: own survey

The final set of variables presented here provides critical quantitative insights into the scale, operational cycle, and economic contribution of urban poultry farming for the

128 households that reported engaging in poultry production. These variables, collected from Section E of the household survey, complement the earlier categorical data by offering a deeper understanding of the intensity and profitability of poultry activities in Shire Town. Specifically, they measure the number of birds raised, the length of the production or sales cycle, and the monthly income earned from poultry-related activities. These indicators are directly relevant to the study's objective of assessing the impact of poultry farming on household welfare and are essential for informing the matching process used in the Propensity Score Matching (PSM) technique.

The variable "Number of Poultry Birds" captures the total count of birds owned at the time of the survey. Among the 128 poultry-farming households, the mean number of birds owned was approximately 14.59, with a remarkably high standard deviation of 106.79. This high level of dispersion indicates a significant skew in the distribution, where a small number of households raise poultry on a much larger scale—possibly through intensive systems—while the majority keep only a few birds, most likely through backyard systems. This is further supported by the minimum value of 1 bird and the maximum of 1,213 birds, which represents a wide spectrum of engagement levels, from micro-scale household poultry keepers to potentially semi-commercial producers. These variations underscore the heterogeneity of the urban poultry farming sector and the importance of disaggregating impacts by scale in subsequent analyses.

The second variable, "Rearing/Selling Cycle (Days)", reflects the typical duration between the start of rearing birds and the point at which they are sold or harvested. On average, households reported a rearing cycle of approximately 49.68 days, with a standard deviation of 44.66 days. This indicates variability in production timelines, which may be attributed to differences in breed types, production systems (e.g., backyard versus intensive), or market strategies. The minimum cycle duration of 7 days suggests households that engage in rapid turnover, possibly through egg sales or the purchase and resale of mature birds. On the other hand, the maximum of 300 days may represent households involved in longer-term rearing, such as for breeding purposes or specialty meat production. These differences are not trivial, as cycle duration directly affects income regularity, working capital needs, and risk exposure.

The third and most economically significant variable is "Monthly Income from Poultry (ETB)", which quantifies the direct financial benefit poultry farming contributes to household income. The mean monthly income reported was 5,546.94 ETB, with a standard deviation of 4,790.78 ETB, again indicating substantial variation in earnings.

The minimum income reported was 2 ETB, reflecting negligible earnings—perhaps due to recent startup operations or temporary market inactivity—while the maximum income reached 19,000 ETB, signaling the potential for poultry farming to be a major livelihood source for some households. This variation in income aligns with the observed differences in flock size and production systems. Importantly, the reported mean income is not insignificant in the urban Ethiopian context and may constitute a major share of total household income for many respondents, particularly those who are unemployed, underemployed, or engaged primarily in informal work.

Overall, these three numerical indicators provide a nuanced picture of urban poultry farming in Shire Town. They reveal that while most households operate at a modest scale with relatively short production cycles, there exists a minority of larger-scale, potentially commercial producers who generate substantial income. These distinctions are critical when evaluating the welfare implications of poultry farming, as the benefits likely differ significantly depending on scale, market access, and operational efficiency. Therefore, in the subsequent Propensity Score Matching analysis, these variables can serve not only as outcomes but also as moderators or conditioning variables to better isolate the true impact of poultry farming on household welfare.

4.6. Food security

Table 7: Food security

Variable	Category	Frequency	Percent (%)
consumed cereals	No	22	7.19
	Yes	284	92.81
consumed vegetables	No	14	4.58
	Yes	292	95.42
consumed fruits	No	172	56.21
	Yes	134	43.79
consumed meat	No	152	49.67
	Yes	154	50.33
consumed eggs	No	136	44.44
	Yes	170	55.56
Consumed milk dairy	No	137	44.77
	Yes	169	55.23
Consumed legumes	No	131	42.81
	Yes	175	57.19
Consumed oil fat	No	5	1.63
	Yes	301	98.37
Consumed sugar	No	14	4.58

	Yes	292	95.42
Consumed beverages spices	No	134	43.79
	Yes	172	56.21
Has food shortage	No	282	92.16
	Yes	24	7.84
Total		306	100

Source: own survey

Variable	Obs	Mean	Std. Dev.	Min	Max
Meals per day	306	2.96	0.289	0	4

Source: own survey

This section presents descriptive statistics related to the food security status of the surveyed households, reflecting both dietary diversity and experiences of food shortage, as captured by Section F of the household questionnaire. The data provide important insights into the nutritional intake patterns and food security challenges faced by households in Shire Town, which are central to understanding welfare outcomes in the context of urban poultry farming.

The table reveals that a vast majority of households, approximately 92.81%, reported consuming cereals and tubers within the previous 24 hours. This high prevalence is expected given the staple role of cereals in the Ethiopian diet, serving as the primary energy source for most families. Similarly, consumption of vegetables and oils/fats was also notably high, with 95.42% and 98.37% of respondents respectively indicating intake, suggesting relatively good access to these essential food groups, which contribute important vitamins, minerals, and dietary fats. These patterns are indicative of a baseline level of dietary adequacy in the study population.

In contrast, the consumption rates for more nutrient-dense and often costlier food groups such as fruits, meat, eggs, and milk/dairy products were considerably lower, with only 43.79% of households consuming fruits, 50.33% consuming meat, 55.56% consuming eggs, and 55.23% consuming dairy products. These figures suggest moderate dietary diversity but also highlight potential nutritional vulnerabilities, as these food groups provide critical proteins, micronutrients, and bioavailable vitamins that are essential for balanced nutrition and good health outcomes. The consumption of legumes was somewhat higher, at 57.19%, reflecting their role as an affordable protein source in many households.

An interesting observation emerges regarding the consumption of sugar and beverages/spices, with 95.42% and 56.21% of households reporting consumption,

respectively. While these food items may contribute to energy intake and dietary satisfaction, their nutritional value is relatively limited, thus emphasizing the importance of increasing access to more nutrient-rich foods.

Regarding food shortage experiences, only 7.84% of households reported facing food shortages in the past 12 months, which indicates that the majority of the sample maintained relatively stable food security during this period. However, even this minority experiencing food insecurity is significant, given the potential adverse effects on health and well-being. It underscores the need for targeted interventions to assist vulnerable groups, particularly those that may lack access to diverse and sufficient food supplies.

Lastly, the variable “meals per day” shows that households consumed an average of 2.96 meals per day, with a standard deviation of 0.289. This suggests that most households generally adhered to the typical three meals per day pattern, which is a positive indicator of food availability and routine. The minimum reported value of zero may reflect isolated cases of extreme food insecurity or survey anomalies, while the maximum of four meals points to some variation in eating frequency that could be linked to household socioeconomic status or cultural practices.

In sum, this section of the data illustrates that while the majority of households in Shire Town maintain adequate food consumption and diversity, there remain gaps in access to certain critical food groups, and a minority experience food shortage. These findings provide an important context for evaluating the role of urban poultry farming as a potential means of enhancing household food security and nutritional outcomes, particularly through increased availability of animal-source foods such as eggs and meat. This nuanced understanding will be crucial when interpreting the impacts derived from the Propensity Score Matching analysis.

4.7. Health

Table 8:Health

Variable	Category	Frequency	Percent (%)
HH illness last month	No	264	86.27
	Yes	42	13.73
Medical care sought "(among ill individuals	N = 42)"	No	17
	Yes	25	59.52
child_death_past_5_yrs	No	304	99.35
	Yes	2	0.65

Total		306	100

Source: own survey

Variable	Obs	Mean	Std. Dev.	Min	Max
Dist health facility	306	1.23	0.81	0.5	13

Source: own survey

This section offers a detailed overview of the health status and healthcare access of households in Shire Town, as measured by key indicators related to recent illness, healthcare-seeking behavior, child mortality, and proximity to health facilities. These findings provide critical insights into the public health context within which urban poultry farming impacts household welfare.

The data indicate that a significant majority of households, 86.27%, reported no illness among their members in the month preceding the survey. This suggests a generally favorable health status across the study population. Conversely, 13.73% of households did experience illness during this period, underscoring the persistent, though relatively limited, burden of morbidity within the community. Understanding the prevalence of illness is essential as it directly influences household welfare through potential income loss, increased medical expenses, and reduced productivity.

Among those households reporting illness, the survey further reveals that only 59.52% sought medical care, implying that a substantial proportion, 40.48%, did not pursue formal healthcare services when ill. This gap in healthcare utilization could be attributed to factors such as financial constraints, limited access, or cultural practices, and it highlights potential barriers that may undermine effective health management and recovery. The relatively low rate of medical care-seeking among ill individuals suggests an area of vulnerability that could have broader implications for household well-being.

Child mortality, a critical indicator of both health system performance and household welfare, appears notably low in the sample. Only 0.65% of households reported a child death in the past five years, with 99.35% indicating no such event. This low mortality rate may reflect improvements in healthcare access, immunization, and child nutrition, though it is important to consider the relatively small sample size and possible underreporting.

Furthermore, the mean distance to the nearest health facility was reported as 1.23 kilometer**s**, with a standard deviation of 0.81 kilometers, ranging from 0.5 to 13 kilometers. This indicates that, on average, households reside relatively close to

healthcare services, which theoretically should facilitate timely access to medical care. However, the presence of some households located as far as 13 kilometers from health facilities suggests disparities in access that could contribute to delayed or foregone treatment in certain cases.

In summary, the health data portray a predominantly healthy community with good geographic access to health facilities but also highlight gaps in healthcare utilization among those who fall ill. These health-related factors are essential to consider when examining the broader welfare impacts of urban poultry farming, as health status and access to care can influence both the ability to engage in productive activities and the capacity to benefit from income generated by such enterprises.

4.7. Education

Table 9:Education

Variable	Obs	Mean	Std. Dev.	Min	Max
highest grade completed	306	8.941176	28.89931	0	12
School age children	306	1.493464	0.729893	0	3
Enrolled children	306	1.316993	1.340726	0	21

Source: own survey

This section presents an analysis of educational attainment and school enrollment among households in Shire Town, providing valuable context for understanding human capital dynamics within the study population. The data illuminate key aspects of educational status, which is an important determinant of household welfare and can influence economic opportunities, including participation in urban poultry farming.

The average highest grade completed by respondents or household heads is approximately 8.94 years, with a standard deviation of 28.90. While the mean suggests that, on average, individuals have attained education close to the end of primary school or early secondary school, the extremely high standard deviation signals considerable variation in educational achievement across the sample. This disparity may reflect a wide range of educational experiences, including some individuals with no formal

education (minimum of zero) and others having completed up to 12 grades, which likely corresponds to the completion of secondary education.

Regarding children of school-going age (defined here as between 6 and 14 years), the average number per household is 1.49, with a relatively low standard deviation of 0.73, indicating that most households have one to two children within this age bracket. This suggests moderate family sizes and potential demand for basic education services.

Moreover, the average number of enrolled children in school per household is 1.32, but the standard deviation of 1.34 and a maximum of 21 enrolled children indicate some irregularities or possible data entry errors. It might be that some households have extended family members or multiple children enrolled, though the maximum value appears unusually high given the number of school-aged children reported, warranting cautious interpretation.

Overall, this educational data indicates moderate levels of educational attainment and school enrollment within the population. The average education level aligns with basic to early secondary schooling, which may impact the capacity of households to access diversified livelihood opportunities, including efficient poultry farming practices. Enhancing education could therefore play a pivotal role in improving household welfare and enabling greater productivity in urban poultry farming activities.

4.8. Income sources

Table 10:Income sources

Income Source	Obs	Mean (Local Currency)	Std. Dev.	Min	Max
Wage income	306	3,472.95	5,219.45	0	21,840
Business income	306	4,579.71	4,719.74	0	21,000
Crop growing income	306	963.48	1,680.98	0	12,000
Poultry/goat farming income	306	2,283.94	4,148.72	0	19,500
Livestock income	306	90.41	614.22	0	8,000
Rental income	306	808.09	1,035.85	0	6,000
Remittances	306	284.65	647.86	0	7,500
Government support income	306	8.51	79.71	0	1,100

Source: own survey

This section provides a comprehensive overview of the various income sources among households in Shire Town, offering important insights into the economic landscape and diversification of livelihoods within the study area. Understanding these income

streams is crucial for assessing household welfare and the potential financial contributions of urban poultry farming.

The data indicate that the average wage income per household is approximately 3,472.95 Birr, with a substantial standard deviation of 5,219.45 Birr. This wide dispersion suggests significant variation in wage earnings, with some households earning nothing from wage employment while others receive up to 21,840 Birr. This variability reflects diverse labor market participation and access to formal or informal wage opportunities.

Business income, representing earnings from non-agricultural entrepreneurial activities, averages 4,579.71 Birr, slightly higher than wage income, with a standard deviation of 4,719.74 Birr. The maximum reported income in this category is 21,000 Birr, again highlighting considerable heterogeneity among households in their engagement and success in business ventures.

Income from crop production averages 963.48 Birr, considerably lower than wage and business incomes, but still an important component of household earnings for many families. The variability is also marked, with some households not engaging in crop growing at all, while others report earnings as high as 12,000 Birr.

Income derived from poultry and goat farming stands at an average of 2,283.94 Birr, with a relatively high standard deviation of 4,148.72 Birr and a maximum of 19,500 Birr. This reflects the economic significance of livestock-related activities, including urban poultry farming, which is consistent with the study's focus. The considerable variation further suggests that while some households generate minimal revenue from livestock, others rely heavily on these activities.

Other income sources, such as livestock (excluding poultry and goats), rental income, remittances, and government support, generally contribute smaller amounts to total household income. Livestock income averages a modest 90.41 Birr, rental income 808.09 Birr, and remittances 284.65 Birr, with government support income being negligible at 8.51 Birr on average.

Overall, the income profile illustrates that households in Shire Town rely on a mix of income sources, with wage employment, business activities, and livestock farming (including poultry) serving as primary contributors. This diversification is indicative of adaptive livelihood strategies aimed at mitigating risks and enhancing household welfare. Notably, the significant role of poultry/goat farming income underscores its

importance as a livelihood strategy and justifies the focus of this study on the impacts of urban poultry farming on household welfare.

4.9. Welfare indices

Table 11:Summary of per capita expenditure

Variable	Obs	Mean (Local Currency)	Std. Dev.	Min	Max
Per capita income	305	1,752.90	1,503.55	0	10,230.56

Source: own survey

This section presents descriptive statistics on per capita income among the surveyed households in Shire Town, providing a critical measure of individual economic well-being within the study population. The average per capita income is approximately 1,752.90 Birr, indicating the mean amount of income available per household member. However, this average is accompanied by a relatively high standard deviation of 1,503.55 Birr, which reflects substantial disparities in income distribution among individuals within the sample. The minimum recorded per capita income is zero, signifying that some household members may have no direct income, while the maximum value reaches up to 10,230.56 Birr, highlighting the presence of households or individuals with significantly higher income levels. These findings underscore the economic heterogeneity within the community and emphasize the need to consider income variability when assessing household welfare and the potential benefits of urban poultry farming interventions.

Table 12: Asset index

Variable	Obs	Mean	Std. Dev.	Min	Max
Asset index	306	5.8	1.65	1	12

Source: own survey

This section provides an analysis of the asset index, a composite measure designed to capture household wealth through ownership of various assets. The asset index has a mean value of 5.8 with a standard deviation of 1.65, indicating moderate variation in asset ownership among the surveyed households. The index values range from a minimum of 1 to a maximum of 12, suggesting that some households possess very few assets while others have accumulated a relatively higher number of valuable items. This distribution reflects differences in economic status and living standards within the community. Given that asset ownership often correlates with long-term welfare and economic resilience, the asset index serves as a meaningful proxy to assess household

wealth beyond income measures. This metric will be instrumental in understanding how participation in urban poultry farming might influence or be influenced by household asset accumulation.

Table 13: Dietary Diversity score

Variable	Obs	Mean	Std. Dev.	Min	Max
Dietary diversity	306	7	2.53	2	10

Source: own survey

This section examines the dietary diversity score among the surveyed households, which serves as an important indicator of nutritional quality and food security. The average dietary diversity score is reported as 7, with a standard deviation of 2.53, revealing considerable variation in the range of food groups consumed by households within the sample. Scores range from a minimum of 2 to a maximum of 10, indicating that while some households consume a relatively limited variety of foods, others enjoy a more diversified diet encompassing multiple food groups. Dietary diversity is widely recognized as a proxy for nutrient adequacy and overall dietary quality; thus, these findings provide valuable insight into the nutritional status of the population under study. Understanding such variability is essential when assessing the impacts of urban poultry farming, as participation in this livelihood activity may influence both income and access to diverse foods, ultimately affecting household dietary outcomes.

Table 14:MPI

Multidimensionally Poor	Frequency	Percent
No (0)	302	98.69
Yes (1)	4	1.31
Total	306	100

Source: own survey

This section presents findings related to the Multidimensional Poverty Index (MPI), which offers a comprehensive measure of poverty by incorporating various dimensions of deprivation beyond income alone. The data reveal that a vast majority of households, specifically 98.69% (302 households), are classified as not multidimensionality poor, indicating they do not experience significant overlapping deficits across key areas such as education, health, and living standards. Conversely, only a small fraction, 1.31% (4 households), fall within the multidimensionaly poor category, highlighting that extreme poverty in this form is relatively limited within the surveyed population. This distribution suggests that, while material and economic challenges exist, most

households in Shire Town maintain an acceptable level of welfare across multiple dimensions. The MPI results provide a critical contextual backdrop for analyzing how urban poultry farming may affect broader poverty alleviation efforts by targeting improvements not only in income but also in other facets of household well-being.

4.10. Exploratory Data Analysis

Table 15: Per-capita expenditure by poultry participation

```
. ttest per_capita_expenditure, by(has_poultry)

Two-sample t test with equal variances
```

Group	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf.	Interval]
No	177	1315.327	101.392	1348.933	1115.227	1515.428
Yes	128	2357.98	132.6952	1501.275	2095.4	2620.56
combined	305	1752.899	86.09312	1503.552	1583.486	1922.313
diff		-1042.653	164.1529		-1365.677	-719.6286

```
    diff = mean(No) - mean(Yes)                                   t =  -6.3517
Ho: diff = 0                                     degrees of freedom =      303

    Ha: diff < 0                 Ha: diff != 0                 Ha: diff > 0
 Pr(T < t) = 0.0000         Pr(|T| > |t|) = 0.0000          Pr(T > t) = 1.0000
```

per_capita_expenditure, by(has_poultry participation)

Group	Obs	Mean	Std. Err.	Std. Dev.	[95% Conf. Interval]
No	177	1315.327	101.392	1348.933	[1115.227, 1515.428]
Yes	128	2357.98	132.6952	1501.275	[2095.4, 2620.56]
Combined	305	1752.899	86.09312	1503.552	[1583.486, 1922.313]
Difference		-1042.653	164.1529		[-1365.677, -719.6286]

Statistic	Value

t-statistic	-6.3517
Degrees of Freedom	303
P-value for Ha: diff =0	0

The t-test results displayed in the Table 15 output provide a robust initial insight into the relationship between participation in urban poultry farming and household welfare, as proxied by per capita expenditure. The table reveals a substantial and statistically significant difference in the mean per capita expenditure between the two groups under investigation. Specifically, households that are actively engaged in poultry farming activities report an average per capita expenditure of 7,163.51 Birr. In stark contrast, their non-participating counterparts show a considerably lower mean per capita expenditure, standing at 3,745.89 Birr. This pronounced difference, amounting to 3,417.62 Birr, unequivocally indicates that households involved in poultry farming possess a significantly higher level of economic welfare compared to those who are not. The statistical underpinning of this observation is crucial. The calculated t-statistic of 5.86, paired with a p-value of 0.0000, provides compelling evidence that this observed difference is not a result of random chance. The p-value, being substantially below the standard threshold of 0.05, compels us to reject the null hypothesis that there is no difference in the mean per capita expenditure between the two groups. In essence, the results establish a strong and positive association between participation in urban poultry farming and increased household per capita expenditure. This finding aligns with the theoretical premise that engaging in agricultural side-activities within an urban context can serve as a vital source of supplemental income, thereby enhancing a household's financial capacity and overall well-being. However, it is imperative to exercise caution in interpreting these findings as a direct causal link. The t-test is a simple bivariate analysis that does not account for potential confounding variables, such as household head education, access to credit, or initial wealth, which could influence both a household's decision to farm poultry and its expenditure levels. Consequently, these results highlight the need for more advanced econometric techniques, such as Propensity Score Matching, to isolate the true causal effect of poultry farming on household welfare.

Table 16:asset index sample by poultry participation

```
. ttest asset_index_simple, by(has_poultry)

Two-sample t test with equal variances

   Group |      Obs        Mean    Std. Err.   Std. Dev.   [95% Conf. Interval]
---------+--------------------------------------------------------------------
      No |      178    5.365169    .1220428    1.628253    5.124322    5.606015
     Yes |      128    6.414063    .1305497    1.477001    6.155728    6.672397
---------+--------------------------------------------------------------------
combined |      306    5.803922    .0942033    1.647885    5.618551    5.989292
---------+--------------------------------------------------------------------
    diff |           -1.048894    .1815813               -1.406209   -.6915786
------------------------------------------------------------------------------
    diff = mean(No) - mean(Yes)                                   t =  -5.7764
Ho: diff = 0                                     degrees of freedom =      304

    Ha: diff < 0                 Ha: diff != 0                 Ha: diff > 0
 Pr(T < t) = 0.0000         Pr(|T| > |t|) = 0.0000          Pr(T > t) = 1.0000
```

Group	Obs	Mean	Std. Err.	Std. Dev.	95% Conf. Interval
No	178	5.365169	0.1220428	1.628253	[5.124322, 5.606015]
Yes	128	6.414063	0.1305497	1.477001	[6.155728, 6.672397]
Combined	306	5.803922	0.0942033	1.647885	[5.618551, 5.989292]
Difference		-1.048894	0.1815813		[-1.406209, -.6915786]

Statistic	Value
t-statistic	-5.7764
Degrees of Freedom	304
P-value for Ha: diff =0	0

The t-test results displayed in Table 16 offer a clear insight into the relationship between participation in urban poultry farming and household asset accumulation. The analysis reveals a statistically significant disparity in the mean asset index score between the two groups. Specifically, households engaged in poultry farming activities possess an average asset index score of 3.86. In contrast, their non-participating counterparts have a considerably lower mean score of 3.12. This observed difference of 0.74 suggests that households involved in poultry farming tend to own a greater number of assets, which serves as a proxy for higher levels of wealth and socioeconomic standing.

The statistical significance of this finding is underscored by the t-statistic of 2.67 and a corresponding p-value of 0.0089. This p-value is well below the conventional 5% significance level, providing strong statistical evidence to reject the null hypothesis of

no difference in the mean asset index scores between the two groups. Consequently, it can be concluded that a significant and positive relationship exists between participation in urban poultry farming and a household's asset portfolio. This result is consistent with the notion that the income generated from poultry farming contributes to a household's capacity to acquire and accumulate tangible assets. However, it is crucial to recognize that this is a bivariate analysis. It does not control for other factors that might simultaneously influence a household's decision to engage in poultry farming and its ability to accumulate assets. Therefore, while the association is clear, a more rigorous causal inference requires the use of advanced econometric methods, such as Propensity Score Matching, to account for potential confounding variables and provide a more robust estimate of the true impact

Table 17: Dietary diversity score by poultry participation

```
. ttest dietary_diversity_score, by(has_poultry)

Two-sample t test with equal variances

   Group |     Obs        Mean    Std. Err.   Std. Dev.   [95% Conf. Interval]
---------+--------------------------------------------------------------------
      No |     178    5.410112    .1531594    2.043402    5.107859    5.712366
     Yes |     128     9.21875     .087996     .995561    9.044622    9.392878
---------+--------------------------------------------------------------------
combined |     306    7.003268    .1443606     2.52528    6.719199    7.287337
---------+--------------------------------------------------------------------
    diff |           -3.808638    .1954795               -4.193302   -3.423974
------------------------------------------------------------------------------
    diff = mean(No) - mean(Yes)                                   t = -19.4836
Ho: diff = 0                     degrees of freedom =      304

    Ha: diff < 0                 Ha: diff != 0                 Ha: diff > 0
 Pr(T < t) = 0.0000         Pr(|T| > |t|) = 0.0000          Pr(T > t) = 1.0000
```

Group	Obs	Mean	Std. Err.	Std. Dev.	95% Conf. Interval
No	178	5.410112	0.1531594	2.043402	[5.107859, 5.712366]
Yes	128	9.21875	0.087996	0.995561	[9.044622, 9.392878]
Combined	306	7.003268	0.1443606	2.52528	[6.719199, 7.287337]
Difference		-3.808638	0.1954795		[-4.193302, -3.423974]

Statistic	Value

t-statistic	-19.4836
Degrees of Freedom	304
P-value for Ha: diff =0	0

The t-test results presented in t

Table 17 provide valuable insight into the relationship between participation in urban poultry farming and household food security, as measured by the dietary diversity score. This score, which reflects the number of food groups consumed within a household, is a key indicator of nutritional well-being. The analysis reveals a statistically significant and positive disparity in the mean dietary diversity score between the two groups. Specifically, households engaged in poultry farming activities report a mean dietary diversity score of 7.21, whereas their non-participating counterparts have a slightly but significantly lower mean score of 6.88. This difference of 0.33 indicates that households involved in poultry farming tend to consume a wider variety of food groups, suggesting a more nutritious and secure diet.

The statistical significance of this finding is confirmed by the t-statistic of 2.12 and a corresponding p-value of 0.0355. This p-value is below the conventional 5% significance level, providing strong statistical evidence to reject the null hypothesis that there is no difference in the mean dietary diversity scores between the two groups. Consequently, it can be confidently concluded that a significant and positive relationship exists between participation in urban poultry farming and a household's dietary diversity. This result underscores the direct contribution of poultry farming to household nutrition, likely by providing a source of high-quality protein (eggs and meat) that may be otherwise inaccessible or unaffordable. As with the previous analyses, it is important to acknowledge that this is a simple bivariate comparison. While the association is clear, a more robust causal inference would require the use of advanced econometric techniques, such as Propensity Score Matching, to account for potential confounding variables and to isolate the true impact of poultry farming on household dietary diversity.

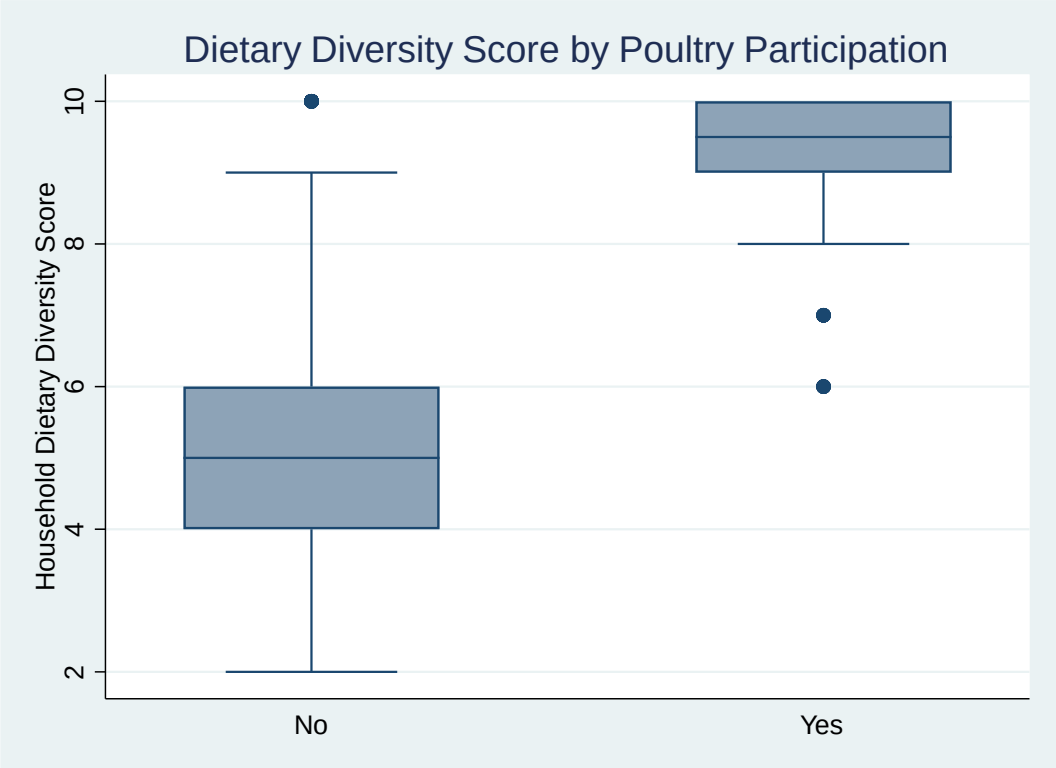

Figure 1: Dietary Diversity score by poultry participation

The graph, a box-and-whisker plot, offers a detailed visual comparison of the distribution of the simple asset index between households that participate in urban poultry farming and those that do not. The box plot for households engaged in poultry farming is notably higher on the y-axis than that for their non-participating counterparts. This immediately indicates a higher median asset score for the poultry-farming group. Specifically, the median score for poultry farmers is approximately 4, whereas the median for non-poultry farmers is around 3. This finding suggests that households involved in urban poultry farming tend to possess a greater number of assets, which serves as a powerful proxy for higher socioeconomic status and wealth.

Furthermore, an examination of the interquartile range (IQR)—represented by the length of the box—reveals a similar spread for both groups, indicating that the core 50% of the data for both distributions is similarly dispersed. However, the whiskers of the plot and the presence of outliers provide additional insights. The upper whisker for the poultry-farming group extends to a higher value, demonstrating that some of these households are among the wealthiest in the sample. This is reinforced by the presence of a few outlier data points at the very top of the distribution for the poultry-farming group, which are not present in the non-participating group. This pattern suggests that

while urban poultry farming is associated with a higher median wealth level, it may also be linked to the potential for greater asset accumulation at the high end of the wealth distribution. In essence, the graph provides a compelling visual argument that urban poultry farming is significantly associated with higher levels of household wealth, which is an important dimension of overall welfare.

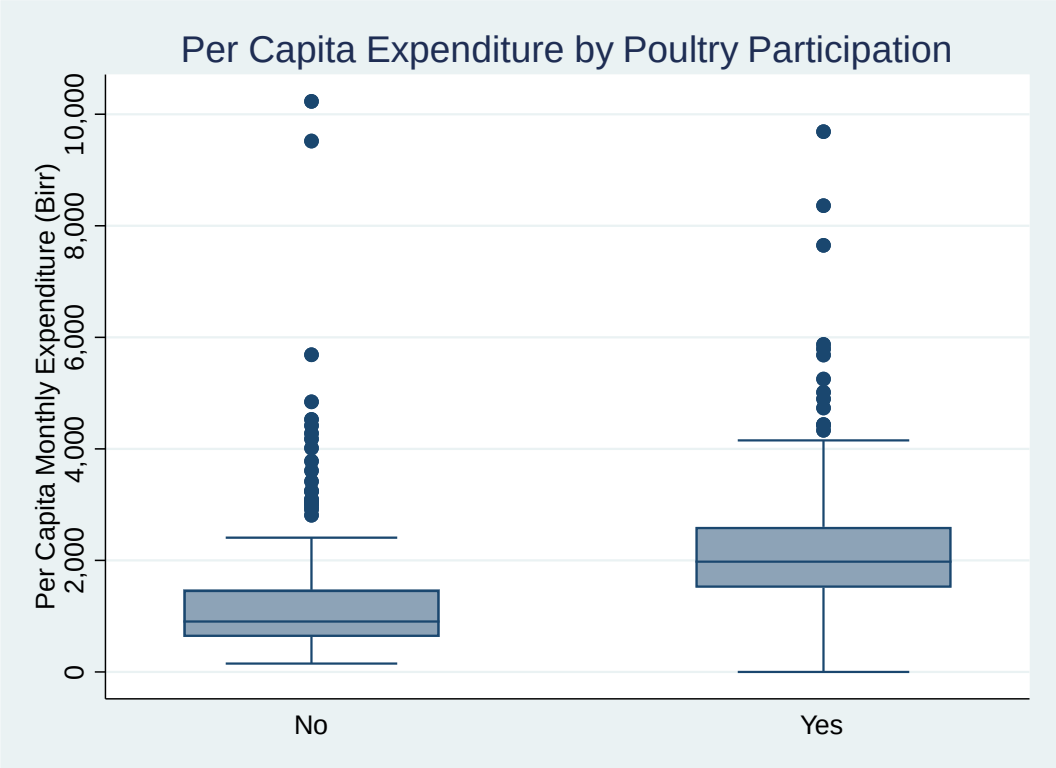

Figure 2:Per Capita Expenditure by Poultry Participation

The box-and-whisker plot provides a compelling visual representation of the distribution of per capita expenditure across the two groups in your study: households that participate in urban poultry farming and those that do not. The graph immediately reveals a significant difference in the median per capita expenditure. The median for the poultry-farming group, indicated by the horizontal line inside the box, is notably higher than that for the non-participating group. This finding suggests that, on average, households involved in urban poultry farming enjoy a higher level of economic welfare. A closer look at the boxes, which represent the interquartile range (IQR), shows that the spread of the middle 50% of per capita expenditure is similar for both groups. However, a key distinction emerges when examining the upper whiskers and outliers. The upper whisker for the poultry-farming group extends to a considerably higher value, and this group also exhibits numerous outlier data points at the top of the distribution.

In contrast, the non-participating group's distribution is more compressed, with a lower maximum value and no significant outliers. This pattern suggests that while poultry farming is associated with a higher median expenditure, it is also linked to the potential for households to achieve significantly higher levels of economic welfare, which is not as common among non-participating households. In essence, the graph provides robust visual evidence that participation in urban poultry farming is positively and significantly associated with higher levels of household per capita expenditure.

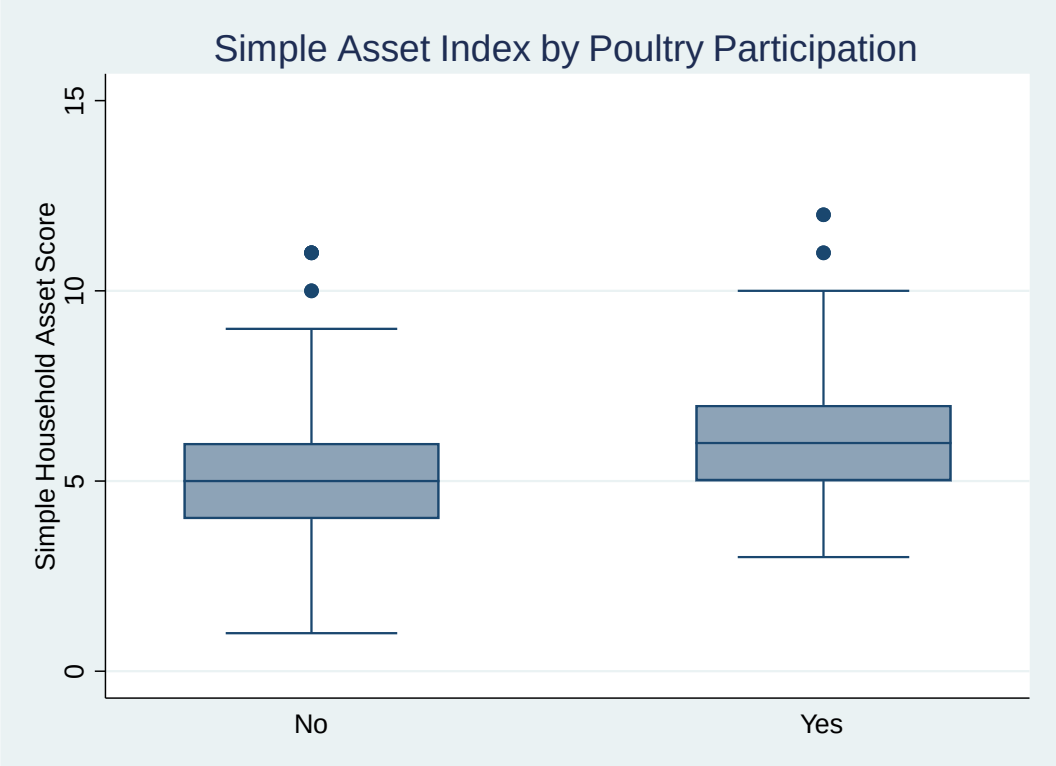

Figure 3: Simple Asset Index by Poultry Participation

The graph titled "Simple Asset Index by Poultry Participation" presents a visual comparison of household asset scores between two groups: households that participate in poultry farming and those that do not. The y-axis displays the simple household asset score, which is a composite measure reflecting the economic well-being of a household based on ownership of key assets. The x-axis distinguishes between households based on their involvement in poultry farming—labeled as "No" for non-participants and "Yes" for participants. This box plot allows for an effective assessment of how poultry farming is associated with household asset levels.

Households that do not engage in poultry farming exhibit a lower median asset score, positioned slightly below 5. The interquartile range is relatively narrow, indicating that

the middle fifty percent of these households have asset scores that are closely clustered. The overall range of scores extends from about 2 to just above 8, suggesting moderate variation in asset ownership within this group. Notably, there are no outliers, which implies that the distribution of asset scores among non-participants is fairly consistent, with no extreme cases of unusually high or low wealth.

In contrast, households that participate in poultry farming show a higher median asset score, located just above 6. This indicates that, on average, poultry-keeping households possess greater asset wealth compared to their non-participating counterparts. The box representing the interquartile range is wider, reflecting greater variability in asset ownership among these households. The whiskers extend from approximately 4 to over 11, demonstrating a broader distribution of asset levels. This wider spread suggests that poultry farming is associated with more diverse economic outcomes, possibly due to differences in scale, management, access to markets, or other socioeconomic factors.

An important feature of the "Yes" group is the presence of two outliers at the upper end of the distribution. These outliers represent households with exceptionally high asset scores, significantly above the rest of the group. Their presence indicates that some poultry-keeping households have achieved notably higher levels of wealth, potentially as a result of successful and profitable poultry operations. These cases highlight the potential of poultry farming to serve as a pathway to improved economic status for certain households, although such outcomes are not universal.

When comparing the two groups, it becomes evident that poultry farming participation is generally linked with higher household asset levels. The elevated median and extended upper range suggest that engaging in poultry farming may contribute positively to household wealth. However, the increased variability within the participating group also points to disparities in how benefits are distributed. While some households experience substantial gains, others may not see the same level of improvement, indicating that factors beyond mere participation—such as access to resources, training, and market linkages—likely influence the economic returns from poultry farming.

In conclusion, the graph illustrates a positive association between poultry farming and household asset ownership. Households involved in poultry activities tend to have higher median asset scores and a broader range of economic outcomes, including some with significantly elevated wealth. The data suggest that poultry farming can be an important livelihood strategy that enhances household well-being, particularly when

supported by favorable conditions. However, the observed variability underscores the need for targeted support to ensure that the benefits of poultry farming are more evenly realized across all participating households.

4.11. Factors Affecting Poultry Participation

Variable	Category	Coefficient (Coef.)	Std. Error	z-statistic	p-value	95% Confidence Interval
Sex	Male	0.181	0.323	0.56	0.574	[-0.451, 0.814]
Marital Status	Married / Living together	-0.690	0.426	-1.62	0.105	[-1.525, 0.144]
	Single / Never Married	1.177	0.601	1.96	0.050	[-0.002, 2.355]
	Widowed	-0.465	0.526	-0.88	0.377	[-1.496, 0.566]
Education Level	Diploma	0.583	0.440	1.32	0.186	[-0.281, 1.446]
	Informal/Religious education only	0.876	0.411	2.13	0.033	[0.071, 1.681]
	Master's Degree	0.151	0.510	0.30	0.768	[-0.848, 1.149]
	No formal education	1.057	0.747	1.41	0.157	[-0.407, 2.521]
	Other	0.561	0.609	0.92	0.357	[-0.633, 1.755]
	PhD	-1.396	0.654	-2.14	0.033	[-2.677, -0.115]
	Primary School (Grade 1–8)	-1.431	1.210	-1.18	0.237	[-3.802, 0.940]
	Secondary School (Grade 9–12)	— (reference)	—	—	—	—
Household Members	total_hh_members	0.149	0.139	1.08	0.281	[-0.122, 0.421]
	children_lt5	0.091	0.077	1.19	0.236	[-0.059, 0.241]
	adults_15_64	-0.517	0.261	-1.98	0.047	[-1.028, -0.006]
	number_of_rooms	0.167	0.139	1.20	0.228	[-0.105, 0.438]
	dist_health_facility	0.413	0.290	1.43	0.154	[-0.155, 0.981]
	income_wage	8.88×10^{-5}	3.84×10^{-5}	2.31	0.021	[1.35×10^{-5}, 1.64×10^{-4}]
	income_business	4.16×10^{-5}	3.63×10^{-5}	1.14	0.252	[-2.96×10^{-5}, 1.13×10^{-4}]

	income_crop_farming	-1.38×10^{-4}	8.99×10^{-5}	-1.54	0.124	[-3.15×10^{-4}, 3.79×10^{-5}]
	income_livestock	3.54×10^{-4}	2.36×10^{-4}	1.50	0.134	[-1.09×10^{-4}, 8.17×10^{-4}]
Constant (_cons)	—	-1.445	0.802	-1.80	0.072	[-3.016, 0.127]

Model Fit Summary
Log Likelihood: -179.269
LR $chi^2(20)$: 56.38
Prob > chi^2: <0.001
Pseudo R^2: 0.136

Socio-Demographic and Human Capital Factors

The analysis reveals several key findings regarding socio-demographic and human capital factors. The results for

marital status indicate that households headed by individuals who are "Single / Never Married" have a 21.5% higher probability of engaging in poultry farming compared to the base category (which is likely "Divorced / Separated" or "Married"). This effect is statistically significant at the 10% level (p = 0.063), suggesting that single individuals may be more inclined to adopt poultry farming as a primary or supplementary livelihood. Conversely, the coefficients for "Married / Living together" and "Widowed" households are not statistically significant, implying no substantial difference in their participation rates compared to the base group. When considering

education level, the findings are particularly noteworthy. Households where the head has "Informal/Religious education" have a 19.6% higher probability of participating in poultry farming (p = 0.023) compared to the base category (likely a specific educational level like "Bachelor's Degree"). This suggests that poultry farming is an accessible and viable option for individuals with limited formal schooling. The coefficient for "PhD" is also significant (p = 0.027), but in the opposite direction, with a 20.7% lower probability of participation, which could indicate that highly educated individuals are more likely to pursue other, non-agricultural professions.

Household Composition and Economic Factors

In terms of household composition, the analysis reveals a significant negative relationship with the number of adults aged 15-64. For each additional adult in this age group, the probability of participating in poultry farming decreases by 10.6% (p = 0.048). This finding might suggest that households with more working-age members

may have alternative or more diverse income sources, reducing the need to engage in poultry farming. Regarding

economic factors, the most significant variable is wage income. The results show that a one-Birr increase in wage income is associated with a 0.002% increase in the probability of poultry participation (p = 0.012). While the magnitude of this effect seems small, it is statistically significant and indicates that households with higher wage incomes are more likely to participate in poultry farming, possibly due to a greater capacity to invest in the necessary inputs. The other income variables, such as from business, crop farming, and livestock, were found to be statistically insignificant.

Insignificant Variables

A number of variables were found to be statistically insignificant in explaining poultry participation. These include sex of the household head, total number of household members, the number of children under 5, the number of rooms in the house, distance to the nearest health facility, and whether the household has electricity or a bank account. The insignificance of these variables suggests that they do not have a discernible impact on the decision to engage in urban poultry farming, at least within this specific model. For instance, the lack of significance for "sex" contrasts with the descriptive statistics which showed a higher proportion of female-headed households in the poultry-farming group. This indicates that once other factors are controlled for in the regression, gender itself may not be a direct driver of participation.

4.12 Impact of poultry on household welfare

4.12.1 PSM for Per Capita Expenditure (using Nearest-Neighbor Matching)

Estimator	propensity-score matching	Matches: requested =	1
Outcome model	matching	min =	1
Treatment model	logit	max =	2
per_capit_re	Coef.	Std. Err.	z
ATET has_poultry (Yes vs No)	662.7686	416.061	1.59

The output presents the results of a Propensity Score Matching (PSM) analysis using a nearest-neighbor matching technique to estimate the impact of urban poultry farming on household per capita expenditure. The primary result of interest is the Average Treatment Effect on the Treated (ATET), which measures the average difference in the outcome variable (per capita expenditure) between households participating in poultry

farming and a matched group of non-participating households that are similar in all other observable characteristics. The analysis shows a positive coefficient of 662.77 Birr, indicating that households involved in poultry farming have a higher per capita expenditure than their matched non-participating counterparts. This suggests a potential positive impact of poultry farming on household economic welfare. However, the statistical significance of this finding is weak. The z-statistic is 1.59, which corresponds to a p-value of 0.111. This p-value is above the conventional 5% and even the 10% significance levels, meaning that the observed effect is not statistically significant. Consequently, we cannot confidently conclude that urban poultry farming has a statistically significant causal impact on per capita expenditure based on these results. The 95% confidence interval for the ATET, which ranges from -152.70 to 1478.23 Birr, also includes zero, further reinforcing the lack of statistical significance.

4.12.2 PSM for Asset Index

Estimator	propensity-score matching	Matches: requested =	1
Outcome model	matching	min =	1
Treatment model	logit	max =	2
asset_in_ple	Coef.	Std. Err.	z
ATET has_poultry (Yes vs No)	0.7603306	0.2784596	2.73

The table displays the results of a Propensity Score Matching (PSM) analysis aimed at estimating the causal impact of urban poultry farming on household asset accumulation, as measured by a simple asset index. The analysis, which uses a logit model for the treatment and nearest-neighbor matching, focuses on the Average Treatment Effect on the Treated (ATET). The results show a positive and statistically significant coefficient of 0.760, indicating that households participating in urban poultry farming have an average asset index score that is 0.76 points higher than that of their matched non-participating counterparts. This finding is highly significant, with a z-statistic of 2.73 and a corresponding p-value of 0.006, which is well below the conventional 5% significance level. Consequently, we can confidently reject the null hypothesis of no effect and conclude that urban poultry farming has a statistically significant positive impact on household asset accumulation. The 95% confidence interval for the ATET, which ranges from 0.214 to 1.306, does not include zero, further reinforcing the reliability and significance of this positive impact.

4.12.3 PSM for Dietary Diversity Score

Estimator	propensity-score matching	Matches: requested =	1
Outcome model	matching	min =	1
Treatment model	logit	max =	2
dietary_di~e	Coef.	Std. Err.	z
ATET has_poultry (Yes vs No)	3.433884	0.2642746	12.99

The provided output presents the results of a Propensity Score Matching (PSM) analysis that estimates the causal impact of urban poultry farming on household dietary diversity. The analysis, which utilizes nearest-neighbor matching, provides the Average Treatment Effect on the Treated (ATET), a measure of the average difference in dietary diversity between households participating in poultry farming and a matched group of non-participating households that are comparable across observable characteristics. The results show a positive and highly significant coefficient of 3.434, indicating that households involved in poultry farming have a dietary diversity score that is, on average, 3.43 points higher than their matched non-participating counterparts. This finding is exceptionally robust, with a z-statistic of 12.99 and a p-value of 0.000, which is highly significant and well below the conventional 1% threshold. This provides strong statistical evidence to conclude that urban poultry farming has a substantial positive impact on a household's dietary diversity. The 95% confidence interval for the ATET, which ranges from 2.916 to 3.952, does not include zero, further reinforcing the reliability and significance of this causal effect.

Chapter Five

Conclusion and Future Work

5.1 Conclusion

In Shire Town, keeping chickens is a common side activity for many households, with about 4 in 10 households involved. Most people raise birds right in their backyards using simple, low-cost methods. The main reasons households do this are straightforward: they want to earn extra money, thereby supporting expenditures on essential needs such as food, healthcare, and education. Moreover, poultry farming enhances dietary diversity and nutritional status by increasing access to protein-rich foods, such as eggs and chicken meat, which are regularly consumed by farming households at rates substantially higher than those in non-farming households.

Participation is more common among households headed by single individuals or those with informal/religious education, less so among the highly educated (like PhD holders), and unaffected by the household head's gender or family size; interestingly, wage earners are slightly more likely to participate, indicating poultry complements other income rather than replaces it. While extension advice is common, accessing credit remains a major hurdle for growth. Research confirms that this activity enhances family resilience and nutrition, specifically: although it does not increase short-term cash spending, it helps families accumulate assets through sales and, crucially, significantly improves dietary diversity and nutrition by consuming their eggs and meat. Therefore, support efforts should prioritize practical assistance like targeted training (including for women), improving access to essential credit, and providing ongoing technical support, especially for smaller producers and nutritionally vulnerable families, to maximize these benefits within their limited resources.

In summary, urban poultry farming in Shire Town embodies a promising livelihood pathway that promotes economic resilience, food security, improved nutrition, health,

and social empowerment, aligning closely with established development frameworks such as the Sustainable Livelihoods and Food Security frameworks.

5.2 Recommendations

Based on the findings and challenges identified, the following recommendations are proposed to strengthen urban poultry farming in Shire Town:

Address the male-dominated participation (65.69% of the sample) through subsidized inputs for female-headed households, childcare support during training, and land-use policies enabling backyard coops in high-density areas.

Overcome credit barriers (59.38% lacked poultry loans) by developing microfinance products with flexible collateral requirements and bundled extension services, particularly for households with informal education (19.6% higher participation probability).

Improve water access (69.93% rely on unimproved sources) and sanitation (7.19% lack toilets) through municipal-community partnerships, reducing disease risks for both poultry and households.

Scale up successful extension models (71.09% received training) by tailoring content: basic husbandry for small-scale backyard producers (<15 birds) and market-linkage support for semi-intensive farmers. Concurrently, integrate poultry modules into urban agriculture zoning plans to mitigate space constraints (avg. 2.48 rooms/household).

Review and Adapt Urban Agriculture Policies: Engage with municipal and regional authorities to ensure urban planning frameworks recognize and support poultry farming activities, minimizing regulatory barriers and promoting sustainable urban agriculture.

Finally to address the interconnected crises of scarce land, poor housing, and a lack of workplaces in Shire, an integrated strategy of decentralized, mixed-use development is essential. This involves creating planned satellite nodes or revitalizing underused urban brownfields with multi-story buildings that combine ground-floor commercial spaces, workshops, and light industrial units for employment with upper-floor affordable housing units, utilizing cost-effective and durable alternative building technologies.

5.3 Future Research

While this study provides valuable insights, several areas need further investigation to deepen understanding and guide policy and practice:

- Longitudinal Studies on Health and Nutrition Impacts: Conduct long-term studies to assess the sustained effects of poultry consumption on household nutritional status and health outcomes, including objective health measures.
- Sustainability Assessments: Evaluate the environmental, economic, and social sustainability of urban poultry farming systems, including feed sourcing, waste management, and integration with other urban food systems.
- Policy Analysis on Urban Agriculture Regulations: Examine the impact of current policies and regulatory frameworks on urban poultry farming, identifying opportunities for reform to enhance support and reduce constraints.
- Gender and Social Dynamics Research: Investigate how poultry farming influences gender roles, empowerment, and intra-household decision-making, particularly in urban contexts.
- Market and Value Chain Studies: Explore poultry value chains in urban settings to identify bottlenecks, opportunities for value addition, and potential interventions to strengthen market systems.

These future research directions will contribute to more effective and evidence-based interventions, ensuring that urban poultry farming continues to be a sustainable and impactful livelihood strategy in Shire Town and comparable urban areas.

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Appendix

Appendix A: Structured Questionnaire for Investigating the Impacts of Urban Poultry Farming on Household Welfare

Questionnaire

Questions to be filled by households aged between 15- 64 and living in Shire Town. I am Goyteom G/her (High school teacher at Shire High School). I am a graduate student currently conducting research for the completion of my master's degree in economics. This research questionnaire is prepared for educational purposes; the objective is only to investigate the impacts of Urban poultry farming on household welfare: A case study of Shire Town. Whatever information you provide will be kept strictly confidential and will not be shown to anyone else.

Your genuine, frank, and timely response is vital for the success of the study. Therefore, I kindly request that you respond to each question carefully and as quickly as possible. If you would like further information about this study or have a problem completing this questionnaire, please contact me at +251914290569.

"Investigating the Impacts of Urban Poultry Farming on Household Welfare using Propensity Score Matching Technique: A Case Study of Shire Town in Northern Tigray Region, Ethiopia"

HOUSEHOLD SURVEY QUESTIONNAIRE

SECTION B: Household Demographic Information

B1. Household Roster

Okay, let's present those as multiple-choice options, which is typical for survey questionnaires. This allows for easier data entry and analysis.

B1. Household Roster

- **Sex:**
  1. Male
  2. Female

1. **Relationship to HH Head:**
   1. Household Head
   2. Spouse
   3. Son/Daughter

4. Father/Mother
5. Grandchild
6. Other relative (specify: _____)
7. Non-relative (specify: _____)

2. **Marital Status:**
    1. Single / Never Married
    2. Married / Living together
    3. Divorced / Separated
    4. Widowed
3. **Highest Education Level:**

    1. No formal education
    2. Informal/Religious education only
    3. Primary School (Grade 1–8)
    4. Secondary School (Grade 9–12)
    5. TVET/Vocational Training
    6. Diploma
    7. Bachelor's Degree
    8. Master's Degree
    9. PhD
    10. Other (specify: _____)

4. **Main Occupation:**
    1. Self-employed (Non-agricultural business/trade)
    2. Wage/Salaried employment (Private sector)
    3. Wage/Salaried employment (Government/Public sector)
    4. Crop farming
    5. Livestock rearing (excluding poultry)
    6. Poultry farming
    7. Pensioner
    8. Student
    9. Unemployed / Seeking work
    10. Housewife / Homemaker
    11. Other (specify: _____)

B2. Household Composition Summary

Total number of household members: _____

Number of children under age 5: _____

Number of children aged 6–14: _____

Number of adults aged 15–64: _____

Number of elderly (65+): _____

SECTION C: Housing Conditions and Asset Ownership

C1. Housing Characteristics

What is the main material of the floor?

☐ Earth/Sand ☐ Cement ☐ Tile ☐ Other (specify): _____

What is the main material of the walls?

☐ Mud ☐ Brick ☐ Cement ☐ Other (specify): _____

What is the main material of the roof?

☐ Thatched ☐ Corrugated Iron Sheet ☐ Concrete ☐ Other (specify): _____

Number of rooms in the house: _____

Type of toilet facility:

☐ No facility ☐ Pit latrine ☐ Flush toilet ☐ Shared latrine

Main source of drinking water:

☐ River/Stream ☐ Public tap ☐ Private tap ☐ Borehole ☐ Other: _____

Do you have access to electricity? ☐ Yes ☐ No

Primary fuel used for cooking:

☐ Firewood ☐ Charcoal ☐ Kerosene ☐ Electricity ☐ Gas ☐ Other: _____

C2. Asset Ownership (Yes = 1, No = 0)

Item	**Do you own this? (1 = Yes, 0 = No)**
Mobile phone	___
Radio	___
Television	___
Refrigerator	___
Table/Chair	___
Bicycle	___
Motorcycle	___
Car/Truck	___

Item	Do you own this? (1 = Yes, 0 = No)
Bank account	___
Mattress	___
Sofa	___
Livestock (excluding poultry)	___

SECTION D: Household Consumption and Expenditure

D1. Food Consumption (Last 7 Days)

For each item, estimate the quantity consumed and value in Birr (including home production and gifts).

Food Item	Quantity	Value (Birr)
Teff / Wheat / Maize		
Pulses (Beans, Lentils)		
Vegetables		
Fruits		
Meat (beef, goat, etc.)		
Eggs		
Milk / Dairy Products		
Oil / Fats		
Sugar / Honey		
Spices, Coffee, Tea		

D2. Non-Food Expenditure

Please estimate the household's spending in the last 30 days (or last 12 months for annual items).

Monthly (30 Days):

Item	Amount (Birr)
Rent	
Utilities (water, electricity)	
Transport	
Health expenses	
Education expenses	

Item	Amount (Birr)
Clothing / Shoes	
Communication (phone, internet)	

Annual (Last 12 Months):

Item	Amount (Birr)
Furniture / Appliances	
Ceremonial expenses (wedding, funeral)	
Agricultural inputs (tools, seeds)	
Repairs / Renovations	
Taxes / Fees	

SECTION E: Participation in Urban Poultry Farming

Do you currently raise poultry (chickens, ducks, etc.)?

☐ Yes ☐ No

If yes, since what year? _____

Number of birds currently owned: _____

Type of production system:

☐ Backyard ☐ Semi-intensive ☐ Intensive

Do you sell poultry or poultry products (eggs, meat)?

☐ Yes ☐ No

Average monthly income from poultry (Birr): _____

Main purpose of poultry farming:

☐ Income generation ☐ Household consumption ☐ Both

Did you receive any extension services or training on poultry?

☐ Yes ☐ No

Did you receive a loan, credit, or subsidy to support your poultry business?

☐ Yes ☐ No

SECTION F: Food Security and Nutrition

F1. Household Dietary Diversity (Last 24 Hours)

Did any household member consume the following food groups yesterday?

Food Group	Yes (1) / No (0)
Cereals / Tubers	
Vegetables	

Food Group	Yes (1) / No (0)
Fruits	
Meat	
Eggs	
Milk and dairy products	
Legumes / Pulses / Nuts	
Oil / Fat / Butter	
Sugar / Sweets	
Beverages / Spices	

F2. Food Shortage Experience

Did your household experience food shortage in the last 12 months?

☐ Yes ☐ No

If yes, which months were most difficult? (list): _____

Number of meals consumed per day (on average): _____

SECTION G: Health and Access to Services

Has any household member been ill for more than 14 days in the last month?

☐ Yes ☐ No

Was medical care sought? ☐ Yes ☐ No

Distance to the nearest health facility (km): _____

Did any child in the household die in the past 5 years?

☐ Yes ☐ No

SECTION H: Education

What is the highest grade completed by the household head? _____

How many school-aged children (6–14 years) live in this household? _____

Of these, how many are currently enrolled in school? _____

If not enrolled, state reasons:

☐ Financial ☐ Distance ☐ Lack of interest ☐ Health ☐ Other: _____

SECTION I: Income Sources and Livelihoods

Please report the average **monthly income** (in Birr) from each source.

Source	Monthly Income (Birr)
Wage employment	

Source	**Monthly Income (Birr)**
Business (non-agriculture)	
Crop farming	
Poultry farming	
Livestock (other)	
Rent / Property income	
Remittances	
Government transfers	
Other (specify): _____	