FACTORS AFFECTING THE CHANGING PRACTICES OF FERTILIZER USE: A SURVEY AMONG FARMER'S OF GODAWARI MUNICIPALITY, FAR-WESTERN NEPAL

Garima Singh

A Dissertation

Submitted to
School of Education

in Partial Fulfillment of the Requirements for the Degree of
Master in Sustainable Development

Kathmandu University
Dhulikhel, Nepal

November 2025

AN ABSTRACT

of the dissertation of *Garima Singh* for the degree of *Master in Sustainable Development* presented on *13 November 2025*, entitled *Factors Affecting the Changing Practices of Fertilizer Use: A Survey among Farmers of Godawari Municipality, Far- Western Nepal.*

APPROVED BY

……

Richan Shrestha

Dissertation Supervisor

The dissertation research is entitled *"Factors Affecting the Changing Practices of Fertilizer Use: A Survey among Farmers of Godawari Municipality, Far-Western Nepal*", which focuses on changing practices of fertilizer use among farmers. While organic practices of soil improvement, which are more sustainable, were often neglected in favor of chemical fertilizers due to ease and quick results, this research aims to investigate the more visible causative factors of farmers changing away from traditional organic fertilizers such as Gobar Compost to new chemical fertilizers based. It focuses on how demographic, socioeconomic, and institutional factors influence their fertilizer choices. Gaining this understanding is important for creating strategies that encourage a balanced and sustainable use of fertilizers, helping to protect agriculture for the future. A representative sample of 361 farmers was selected using Cochran's sample size formula. A structured questionnaire was used to collect data from respondents considering ten selected factors associated with fertilizer use. Survey data were analyzed using SPSS software and both descriptive and inferential statistical methods were used for analysis. The findings indicated that while chemical fertilizers such as UREA and DAP were the most commonly used due to their ability to provide quick yields, most farmers still apply organic methods to maintain soil health. Seven factors emerged as most associated with farmers' fertilizer behaviors: age, gender, land size, farming experience, soil fertility, seed source, and knowledge

of soil fertility assessment. The study emphasizes the important role that government support could have in promoting balanced fertilizer use in order to sustain agricultural productivity over time. It provides valuable guidance for policymakers and agricultural stakeholders to develop tailored approaches that meet farmers' diverse needs and promote the integration of both organic and chemical fertilizers for sustainable farming in Nepal.

…… 13 November 2025

Garima Singh

Degree Candidate

शोध सार

विकास शिक्षामा स्नातकोत्तर उपाधिका लागि गरिमा सिंहको शोध प्रबन्धको शीर्षक "मल प्रयोगका बदलिँदै गएका अभ्यासहरूलाई प्रभावित गर्ने कारकहरू: गोदावरी नगरपालिका, सुदूरपश्चिम नेपालका किसानहरू बीचको एक सर्वेक्षण" २७ कार्तिक २०८२ मा प्रस्तुत गरिएको थियो ।

.....

रिचन श्रेष्ठ

शोध निर्देशक

"मल प्रयोगका बदलिँदै गएका अभ्यासहरूलाई प्रभावित गर्ने कारकहरू: गोदावरी नगरपालिका, सुदूरपश्चिम नेपालका किसानहरू बीचको एक सर्वेक्षण शीर्षकको यस शोधप्रबंधले यस क्षेत्रका किसानहरूले अपनाउँदै आएका मल प्रयोगका अभ्यासहरूमा आएको परिवर्तनको गहन विश्लेषण गर्दछ। परम्परागत रूपमा दीगो मानिने जैविक मल तथा माटो सुधारका विधिहरू प्रचलित रहे तापनि छिटो परिणाम दिने र प्रयोगमा सहज भएकाले रासायनिक मलको प्रयोग ती विधिहरूमाथि क्रमशः हावी हुँदै गएको छ। यो अध्ययनले किन किसानहरू गोबर कम्पोस्टजस्ता पारम्परिक जैविक मलहरूबाट हट्दै नयाँ रासायनिक मलतर्फ आकर्षित हुँदै छन् भन्ने मुख्य कारणहरू पहिचान गर्न केन्द्रित छ। यस अनुसन्धानले जनसांख्यिकीय, सामाजिकआर्थिक तथा संस्थागत पक्षहरूले किसानहरूको मल छनोटमा कत्तिको प्रभाव पार्छन् भन्ने कुराको परीक्षण गरेको छ। यी प्रभावहरूको पहिचान दीगो कृषि प्रणालीलाई प्रवर्द्धन गर्ने तथा सन्तुलित मल प्रयोगलाई प्रोत्साहित गर्ने नीतिगत रणनीति बनाउन अत्यन्तै आवश्यक मानिन्छ। यसका लागि कोक्रानको नमूना आकार सूत्र (Cochran's sample size formula) प्रयोग गरी ३६१ किसानहरूको प्रतिनिधिमूलक नमूना चयन गरिएको थियो। मल प्रयोगसँग सम्बन्धित दसवटा प्रमुख पक्ष समावेश गरी संरचित प्रश्नावलीमार्फत तथ्याङ्क संकलन गरिएको थियो। संकलित तथ्याङ्कलाई SPSS सफ्टवेयर प्रयोग गरी विवरणात्मक र अनुमानात्मक दुवै प्रकारका सांख्यिकीय विधिबाट विश्लेषण गरिएको छ।

यस अध्ययनका निष्कर्षहरूले युरिया र डिएपीजस्ता रासायनिक मलहरू छिटो उत्पादन वृद्धि गर्ने क्षमताका कारण सबैभन्दा बढी प्रयोगमा रहेको देखाउँछन्। तर, माटोको दीर्घकालीन उर्वरता जोगाइ राख्न धेरै किसानहरू अझै पनि जैविक विधिहरू प्रयोग गरिरहेको पाइयो। सातवटा कारकहरु : उमेर, लिङ्ग, जग्गाको आकार, खेती गर्ने अनुभव, माटोको उर्वरता, बीउ प्राप्तिको स्रोत, तथा माटो

उर्वरता मूल्यांकनसम्बन्धी ज्ञान, किसानहरूको मल प्रयोग सम्बन्धी अभ्याससँग विशेषरूपमा सम्बन्धित देखिए।

यस अनुसन्धानले कृषि उत्पादन दीगो राख्न सन्तुलित मल प्रयोग प्रवर्द्धन गर्न राज्यका नीतिहरूले महत्वपूर्ण भूमिका खेल्न सक्ने सम्भावनालाई जोड दिएको छ। साथै, किसानहरूको विविध आवश्यकतालाई ध्यानमा राख्दै लक्षित कार्यक्रमहरू विकास गर्न नीति निर्माणकर्ताहरु तथा कृषि सरोकारवालाहरूका लागि यसले उपयोगी मार्गनिर्देशन प्रदान गर्दछ। जैविक र रासायनिक दुवै प्रकारका मलहरूको विवेकपूर्ण र एकीकृत प्रयोगले दीगो खेती प्रणाली विकासमा योगदान पुऱ्याउने यस अध्ययनको सारभूत सन्देश हो।

..... २७ कार्तिक २०८२

गरिमा सिंह

उपाधि उम्मेदवार

This dissertation entitled *Factors affecting the changing Practices of fertilizer use: A Survey among farmers of Godawari Municipality, Far- Western, Nepal p*resented by *Garima Singh* on 13 November 2025.

APPROVED BY

…… 13 November 2025

Richan Shrestha

Dissertation Supervisor

…… 13 November 2025

Sagar Mani Neupane, PhD

External Examiner

…… 13 November 2025

Asst. Prof. Suresh Gautam, PhD

Head of Department, Development Education

…… 13 November 2025

Prof. Bal Chandra Luitel, PhD

Dean/ Chair of Research Committee

I understand that my dissertation will become a part of the permanent collection of the library of Kathmandu University. My signature below authorizes the release of my dissertation to any reader upon request for scholarly purposes.

…… 13 November 2025

Garima Singh

Degree Candidate

DECLARATION

I hereby declare that this dissertation is my original work, and it has not been submitted for candidature for any other degree at any other university.

…… 13 November 2025

Garima Singh

Degree Candidate

DEDICATION

I dedicate this dissertation to my beloved family whose unwavering support and guidance has been the cornerstone of my academic journey. To my loving parents, Pradeep Singh and Sarala Singh, your love, encouragement and sacrifices have fueled my passion for learning and achievement. I appreciate your unwavering belief in me despite the seemingly overwhelming obstacles.

ACKNOWLEDGEMENTS

I would like to sincerely thank those who contributed immensely to my research on “Factors Affecting the Changing Practices of Fertilizer Use: A Survey among Farmers of Godawari Municipality, Far- Western, Nepal.” It has been a fascinating journey, and I owe many individuals for its success, support and cooperation.

To start, I would like to express my heartfelt appreciation to the farmers of Godawari Municipality, who were enthusiastic participants in the survey and readily shared their valuable experiences regarding the changing practices of fertilizer application. The time you dedicated to participating in interviews and discussions was instrumental in enabling this research.

I am also very appreciative to the host families and local villagers who opened their homes to me and helped me connect with their families. Your hospitality and support made my field research successful and memorable.

I wish to express my sincere appreciation to my advisor, Mr. Richan Shrestha, for his suggestions, skills, and exceptional commitment to quality which greatly enhanced the content and quality of this thesis. I want to express my tremendous gratitude to Kathmandu University School of Education for providing a supportive environment and a guide during my research.

As a researcher, this has been a wonderful learning experience throughout the journey. I would like to thank my brother, Arbin Poudel, for being supportive, and participating in conversations throughout the process. I have been influenced by everyone who participated. I truly believe that results of this study will help to contribute to the development of agricultural practices that enhance the living and well-being of farmers.

Garima Singh
Degree Candidate

TABLE OF CONTENTS

ABBREVIATIONS

ADS	Agriculture Development Strategy
AICL	Agriculture Inputs Company Limited
DAP	Diammonium phosphate
DFS	Detailed Feasibility Study
FAO	Food and Agriculture Organization
FTF	Feed the Future
GPK	Geo Krishi Partnership
GAP	Good Agricultural Practices
GON	Government of Nepal
GDP	Gross Domestic Product
Ha	Hectare (a unit of area used in agriculture)
INM	Integrated Nutrient Management
IM	Inorganic Manure
JICA	Japan International Cooperation Agency
KUSoED	Kathmandu University School of Education
Kg -	Kilogram
MOALD	Ministry of Agriculture & Livestock Development
MT	Metric Tons
NPK	Nitrogen, Phosphorus, Potassium
NGO	Non-Governmental Organization
NARC	Nepal Agricultural Research Council
NRM	Natural Resource Management
NSAF	Nepal Seed & Fertilizer Project
PPK	Pashu Palan Karja
SOP	Statement of Purpose
SDG	Sustainable Development Goals
STCL	Salt Trading Corporation Limited
UNCCO	United Nations Convention to Combat Desertification
UNCBD	United Nations Convention on Biodiversity
UNFCCC	United Nations Framework Convention on Climate Change

LIST OF FIGURES

LIST OF TABLES

CHAPTER I
INTRODUCTION

Agriculture in the Far-Western region of Nepal, especially in Godawari Municipality, is undergoing significant changes. This change is happening because of various social and economic pressures, along with global trends that push local farmers to adapt so they can stay competitive and meet the evolving needs of the market. As science and technology develop, traditional farming methods that have been used for generations are slowly giving way to more modern approaches, such as the increased use of chemical fertilizers (Kansanga et al., 2018). There is no doubt that these inputs can boost productivity, but many people are increasingly worried about their long-term effects on soil health, the environment, and the well-being of smallholder farmers (Nsengimana et al., 2023; Pahalvi et al., 2021). This study looks into the reasons behind changing fertilizer use in Nepal's agriculture. By understanding what influences farmers' decisions on applying fertilizer, it seeks to add valuable insights to the ongoing conversation about promoting sustainable agriculture in the country (Pandey, 2014; Takeshima et al., 2016).

Farmers' use of fertilizers is influenced by many factors that connect local farming with broader global goals for sustainable development. Fertilizers are vital for boosting crop yields, helping to meet the increasing food needs of a growing population while also protecting the environment (Yara, 2024). Agriculture plays a vital role in our national economy and the livelihoods of many people. It's important to understand the wide range of social, economic, institutional, and technological factors that affect whether farmers choose to use fertilizers. Their selections are influenced by factors such as the size of their farm, their income level, availability to financing, expertise, and their perspective on technology (Pani et al., 2021; Wokibula et al., 2025). Recognizing these interlinked dynamics informs policy and extension services, supporting sustainable intensification of agriculture while aligning with broader economic and environmental objectives (Lin et al., 2022; McArthur, 2017). Therefore, by conducting a thorough evaluation of these variables through empirical research, this study aims to provide policymakers with valid information and useful suggestions. The results are intended to aid Godawari and might perhaps be used as a pattern for other similar sites. The municipality works to encourage more sustainable

agriculture techniques. Godawari The reason behind selecting the topic "Factors Affecting the Changing Pattern of Fertilizer Use" was to understand the complex interplay between various external factors such as gender, education, land area size, number of family members, soil fertility and infrastructure available, etc. that influence the fertilizer use pattern among farmers, especially in remote regions like Godawari Municipality in Far-Western Nepal. To encourage sustainable agricultural practices among farmers, the farmers must be made aware of the factors that influence the farmers' decisions on approaching the farming practices. These things fluctuate as farming methods do. Since, it demonstrates how the options that farmers make and how they make decisions about fertilizer application have a direct impact on soil health, agricultural productivity, and agricultural sustainability, this topic intrigues me. This thesis seeks to address this issue and offers remedies that encourage the responsible use of fertilizers, which will enhance the ecological well-being and agricultural output of the area.

Background of Study

The word "agriculture" includes the widest variety of practices used to produce food and various other products from domesticated animals and agricultural crops in order to sustain the global population. The Oxford English Dictionary (1971), defines agriculture as "the science and art of cultivating the soil, including the associated activities of gathering in the crops and rearing livestock, cultivation, husbandry, and farming." Agriculture is a socio-economic and ecological process through which communities manage land, biodiversity, labor, and technology to produce food, fiber, and raw materials. It serves as a foundation for rural livelihoods, cultural traditions, and national economies (Food & Agriculture Organization [FAO], 2018).

Since in many countries' agriculture contributes significantly to Gross Domestic Product, it is the main driver of the national economy (Vista et al., 2022). Millions of people depend on agriculture for their livelihoods and the global food supply. In order to guarantee that we continue to produce what we require, it is necessary to care for livestock and maintain natural resources, in addition to planting crops. Agriculture is the primary source of income for many communities, particularly in developing nations like Nepal, where a large percentage of the labor force works in this industry (Vista et al., 2022). It is crucial for food security,

economic stability, and overall development (Food & Agriculture Organization [FAO], 2017).

In Nepal, agriculture has a unique position that extends beyond its economic significance. It is deeply embedded within the cultural customs and social livelihood of communities all around the country. Indigenous knowledge that has been handover through the centuries among various generations establishes the foundation of many traditional farming practices. These methods demonstrate an extensive illustrations of local traditions and the environment, which has been honed throughout time (Sapkota & Bajracharya, 2018). Land ownership is deeply connected to a community's identity and heritage, carrying meaning across generations. Meanwhile, agriculture occupies a special place in the daily lives of farming communities on dimensions of food security, economic status, and social position thereby underscoring how closely agriculture relates not only to livelihoods but also to cultural values (Moreda, 2023). The prosperity and sustainability of agricultural practices determine community well-being as they have a direct bearing on both their food security and income sources (Ghimire & Dhakal 2021). Better agricultural practices are important not only for higher yields but also for improving farmers' lives as well as advancing the country's sustainable growth.

Agriculture today is changing rapidly, shaped by new scientific discoveries, technological innovations, and shifts in social and economic conditions (Muhie, 2022). For centuries, communities have relied on traditional farming methods to sustain their livelihoods. Today, these time-honored practices are gradually being complemented or replaced by modern techniques that focus on improving efficiency, boosting productivity, and promoting sustainability (Huang & Wang, 2024). Fertilizers are vital in today's farming because they improve soil health and help increase crop production. They have changed the way we grow crops, allowing farmers to better meet the rising food needs of people around the world. This change is driven by the pivotal need to feed a fast-growing population, adjust to climate change, and make the best use of available resources (Jones, 2023). Fertilizers play a vital role in restoring important nutrients like nitrogen, phosphorus, and potassium that crops use up from the soil. Without using enough fertilizers, maintaining the level of agricultural productivity needed to feed the growing global population would be very difficult. Because of this, fertilizers have become essential in farming around the

world, helping to ensure food security and supporting economic growth (Burtan et al., 2018).

Technological progress has changed farming methods significantly, especially in how fertilizers are used, encouraging a move toward more sustainable agriculture. New approaches, like using organic fertilizers and precision farming tools, help farmers apply nutrients more accurately and efficiently. This not only increases crop yields, but it also reduces environmental impact (John & Babu, 2021). Precision farming helps growers apply the optimal amount of fertilizer to their fields at the right location, reducing waste and protecting against soil depletion. It boosts crop yields while saving important resources, making farming more sustainable and environmentally friendly (Britz et al., 2023). These changes are evidence of the evolution in fertilizer practices and of the continued need to implement approaches that are sustainable and responsible in their adoption of technology that are safe for the environment and enhancing agricultural production.

Policies from the government are also extremely significant as they affect farming practices by supporting programs and incentives. For instance, policies that support organic farming or provide subsidies on a particular fertilizer will impact farmers' decisions.(Arun & Ghimire, 2017). In Nepal, the Agriculture Development Strategy (ADS) 2015-2035 has taken steps to encourage sustainable farming practices by focusing on a balanced approach that includes both chemical and organic fertilizers (Ministry of Agricultural Development, 2015). Furthermore, the government has supported the farmer communities by providing subsidies, loans, and collateral-based financing for agricultural inputs and mechanization, which facilitate access to modern technologies and improve productivity (Himal Press, 2025; Nepal News, 2025).

While policy support forms a critical enabling environment, the actual adoption and outcomes of these agricultural initiatives are strongly influenced by farmers' socioeconomic conditions (Feliciano, 2022), which shape their capacity to access, interpret, and implement such policies effectively (Sánchez Bogado et al., 2024). Farmers' choices are also influenced by economic variables including educational level, farm size, and access to training. For instance, those with higher educational levels tend to make better-informed decisions by using fertilizers in a more balanced way (Aryal et al., 2021). Women farmers often encounter specific challenges, especially when trying to access fertilizers and technical knowledge, due

to the influence of gender dynamics (Diiro et al., 2018). Larger farms usually have better access to resources that help them use fertilizers more efficiently. Conversely, smaller farms may struggle to manage their resources effectively, which may lead to them overusing chemicals on occasion (ZHU et al., 2022).

The type of fertilizer chosen by a farmer will usually depend on the crop species grown on the farm and the local traditions of farming. Since different crops require different nutrients, this naturally affects which fertilizers they use (Hamid et al., 2021). Some farmers prefer organic fertilizers because cultural beliefs and farming traditions have made sustainable practices a natural part of life in their communities (Materechera, 2010).

Looking at factors like government policies, socioeconomic conditions, the types of crops grown, and local farming traditions helps us better understand the ongoing shifts in agriculture and fertilizer use among farmers. This understanding is significant because it informs policy and practice designed to foster sustainable agriculture and productivity in the long term. The shifts in fertilizer usage represent a broader shift within agriculture, influenced by new technology, regulatory measures, and environmental considerations. Farming today blends digital tools and data-driven practices for better decision-making and resource use efficiency. At the same time, policy reforms and land use rules have encouraged farmers to adopt more sustainable approaches, further influencing how fertilizers are applied.

In this regard, a significant change in Godawari Municipality's agricultural, cultural, and livelihood systems is represented by the evolving fertilizer use methods. Farmers used to rely on Gobar dung and compost, which are strongly associated with raising livestock, family chores, and cultural standards for soil maintenance and natural cycles. The deeply ingrained ecological knowledge system that governed how societies preserved soil fertility over many centuries included these organic techniques. But as UREA, DAP, and other chemical fertilizers have become more widely available, farmers have progressively shifted to inputs that promise higher yields while requiring less effort (Dhakal et al., 2024). This change represents both an agronomic and cultural shift, with contemporary, market-driven inputs either replacing or augmenting long-standing organic methods. This shift has been driven by demand to boost productivity, adjust to workforce shortages brought on by migration, and address the increasing commercialization of agriculture (Zhan et al., 2025).

Fertilizer use in the area thus serves as an example of how larger socioeconomic shifts are changing traditional farming practices and impacting farmers' means of subsistence.

Statement of the Problem

The increasing use of chemical fertilizers since the end of the 20th century has been key to raising agricultural productivity; however, extensive dependence on chemical fertilizers has raised serious concerns about the long-term sustainability of agriculture. When chemical fertilizers provide a quick, easy yield, it can be easy to overlook the more sustainable, less environmentally damaging traditional organics. While these fertilizers do provide short-term gains, they can harm soil health over time, causing issues like erosion, soil compaction, degradation, and a significant drop in the diversity of microbes that are crucial for keeping ecosystems healthy. Giving less importance to appropriate fertilizer use can lead to declining soil fertility, reduced crop productivity and long term soil degradation (Wang et al., 2023; Zhou et al., 2023). Whereas, over reliance on chemical fertilizers without balancing organic inputs disrupts soil structure, harms beneficial microorganisms, and increase production costs for farmers. This neglect can also intensify environment pollution, reduce and climate resilience and threaten future food security (Gamage et al., 2023). As a result farmers may face declining yields and unstable farming systems.

Many studies on fertilizer use in Nepal have primarily focused on broad national or regional trends, often overlooking the nuanced realities at the local level (Aryal et al., 2021; Shrestha et al., 2022). In areas such as Godawari rural municipality, limited attention has been given to how the practice of farmer’s fertilizer use is transitioning from traditional organic fertilizers to modern chemical alternatives. The influence of certain factors like local soil conditions, availability of agricultural extension services, government incentives, and farmers’ cultural values that influenced farmers’ use of fertilizers is still under-researched (Baral et al., 2020). While there is awareness of the risks to the environment and health from excess use of chemical fertilizers, farmers’ motivations for using these inputs in specific settings like Godawari are still largely unstudied (Baral et al., 2020; Lama, 2024).

There is a major knowledge gap in the existing literature we reviewed, primarily due to the absence of local data which reflects the socioeconomic, educational, and policy influences on fertilizer-use decision making. Farmers' choices

emerge from a complex interplay of factors that include government policies, landholding size, gender dynamics, education level, access to extension services, and adherence to traditional agricultural practices (Jha et al., 2021;Thapa et al., 2023). Current Nepali research insufficiently addresses how these factors collectively shape fertilizer use at the local scale. Farmer's in Godawari are shifting towards greater chemical and mixed fertilizer use. This change is shaped by demand in yield, government subsidies, labor shortage, and soil productivity challenges. However, the dynamics behind these transition remain largely unexplored creating a critical gap that this study seeks to address.

Addressing this gap is critical to formulating strategies that encourage a balanced and sustainable approach to fertilizer application. Implementing interventions is critical for preventing future degradation of the environment, the potential damage to public health and for the long-term productive capacity of agriculture (Vista et al., 2022). Lack of an adequate understanding of the influence of these variables presents a danger to both food security and the economic viability of farming communities.

This holds paramount importance for localized deep research about the factors driving changes in fertilizer use practices among farmers in Nepal. Understanding these factors will help to inform the development of active policies and programs directed towards sustainable farming practices, ecosystem protection and improving rural farmers' livelihoods.

Purpose of the Study

This research seeks to identify the factors that have influenced the changing practices of fertilizer application among farmers in Godawari Municipality in Kailali. Understanding these shifts is essential for addressing sustainability concerns and supporting farmers in adopting balanced fertilizer practices.

Research Questions

To fulfill this purpose and guide the overall direction of the thesis, the study focuses on the following questions:

i. What are the current patterns of fertilizer use (organic, chemical, or both) among farmers in Godawari Municipality?
ii. What factors influence the changing practices of fertilizer use among the farmers in Godawari Municipality, Kailali?

Hypotheses

H1: Age influence on types of fertilizer use.

H2: Gender influence on types of fertilizer use.

H3: Education influences fertilizer types.

H4: Land holding influence on types of fertilizer use.

H5: Experience of farming influence on types of fertilizer use.

H6: Labor influence on types of fertilizer use.

H7: Soil fertility status influences on types of fertilizer use.

H8: Seed source influence on types of fertilizer use.

H9: Soil fertility analysis influences on types of fertilizer use.

H10: Soil test influence on types of fertilizer use.

Rationale of the Study

The rationale behind this research is essentially rooted in the critical need to understand the shifting trends in fertilizer use in Nepal, more precisely, within the Godawari Municipality of Far-Western Nepal. Fertilizers are quite fundamental in advancing crop yields and ensuring food security; however, environmental and economic effects of overdependence on chemical fertilizers call for an in-depth understanding of the decision-making process concerning fertilizer use among farmers (Aryal et al., 2021). As we have already established, government policies, market access, education level, and landholding size are some of the factors known to influence these decisions and, therefore, determine which variables most strongly influence fertilizer Practices. Without exploring how demographic characteristics, education, landholding size, government policies, and traditional practices collectively shape farmers' decisions, this knowledge gap makes it difficult for policymakers and development practitioners to design effective, targeted interventions that promote balanced and sustainable fertilizer use.

The natural regenerative potential of the soil is weakened when farmers underuse organic fertilizers or disregard integrated soil fertility management. This results in deteriorating soil structure, decreased microbial diversity, and long-term fertility loss. However, using quick-acting chemical fertilizers without conducting a thorough soil evaluation increases soil acidity, speeds up nutrient mining, and raises the danger of environmental deterioration such water contamination and nutrient outflow. Farmers have become more reliant on chemical inputs to sustain yields as a

result of this mismatch, which raises production costs and weakens their ability to withstand market and climate shocks. With decreasing soil productivity undermining agricultural sustainability, increasing financial vulnerability, and undermining traditional knowledge systems that once supported soil health, these effects eventually pose a direct danger to livelihood security. Therefore, the lack of focus on sustainable fertilizer methods is not only an agronomic issue but also a socioeconomic and environmental one that exacerbates the situation as a whole.

This decision to study Godawari Municipality, in Far-Western Nepal, is based on its importance as a changing agricultural region. Here, traditional farming methods still exist alongside the growing use of modern, chemical-based inputs. The goal is to comprehend how local farmers employ these two different systems together, practicing their traditional farming style with organically based fertilizers passed down since generations previously, in conjunction with new approaches such as commercially produced chemical fertilizers, to produce high amounts of crops. In contrast to the majority of literature that focuses on the condition of organic farming positively or chemical fertilizers efficiently, this research will demonstrate the effectiveness of farmers who use these two strategies interchangeably. The research discusses the social, economic, and knowledge aspects of farmers' choices, which encompasses balancing environmental stewardship and productivity demands, in order to oversee healthy soil, while being able to produce sufficient crops for their family/market. The conclusion will assist in informing policies that encourage sustainable farmland use, by the deliberate and cautious management of both approaches towards a commitment to uphold the importance of the soil system, for the beneficial and preventative outcomes for agricultural use of the soil (Baral et al., 2020). By systematically investigating the factors affecting the changing Practices of fertilizer use among farmers in Godawari Municipality, the research will provide valuable insights into the motivations, constraints, and decision-making processes of local farmers. Drivers of these will have paramount importance in formulating interventions that would improve agricultural productivity and contribute to the broader goal of achieving sustainable agricultural development goals of Nepal.

Significance of Study

The contribution of the research lies in its focus on understanding the changing Practices of fertilizer uses among farmers in Godawari Municipality, Far-Western Nepal. The key factors that explain the demography, socioeconomic elements, influencing fertilizer choices, are brought out through research, such as age, gender, education, size of landholdings, and farming experiences. The study provides a detailed insight into behavior that national-level studies frequently ignore by determining how factors like age, gender, landholding size, farming experience, soil fertility expertise, and seed source affect farmers' fertilizer decisions. The results also show how soil health, production costs, and long-term agricultural sustainability are impacted by the increasing reliance on chemical fertilizers and the slow loss of organic practices with cultural roots. The study sheds light on what factors matter to farmers when using fertilizers and will be helpful in understanding how farmers' traditional and modern practices are evolving. It will be helpful for sustainable agriculture and farmers understand how to improve crop yield without compromising soil health. For policymakers, this study provides actionable recommendations for designing targeted extension programs, improving the delivery of soil testing services, increasing access to balanced fertilizers, and promoting integrated nutrient management tailored to the realities of smallholder farmers. The research will also serve as a model for other regions in Nepal that are facing similar agricultural problems, and, in the process, contribute to the greater efforts in sustainable agricultural development and environmental conservation across Nepal. Thus, the significance of this research lies in its ability to inform sustainable agricultural planning, evidence-based policy formulation, and community-level decision-making based on grounded, field-generated data.

Delimitation of the Study

These findings of this research are limited to the various factors influencing the changing Practices of fertilizer use among farmers within Godawari Municipality, Far-Western Nepal only. This research narrows itself to the factors that have a direct forewarning on fertilizer use Practices, such as agricultural practices, access to resources, age, gender, education, landholding size, and farming experience. Other potential influencing factors, such as cultural practices, individual farmers’ personal beliefs, or environmental concerns, though being acknowledged, are not explored in

detail due to the narrow scope of the study. This will help in keeping the analysis conscious of a focused approach.

Organization of the Study

This study is organized into six chapters, each of which addresses different aspects of the research. The First chapter introduces the study, including the background, statement of the problem, purpose of the study, research questions, rationale, significance and delimitations of the study. Chapter Two looks closely at existing literature, including key themes, policies, and the ideas that shaped this study's framework. Chapter Three discusses how the study was completed, providing details of the quantitative design, survey methods, study area, sampling participants, and data collection and analyses. Chapter Four discusses the study findings with precision. Chapter Five relates the findings back to the original research question/problem to understand the implications of findings. Chapter Six concludes the research with a summary of the findings, recommendations, and reflections and acknowledgements of the study limitations. This structure creates a clear and coherent research flow from identifying the research issue to concluding with relevant and informative conclusions and recommendations.

CHAPTER II
LITERATURE REVIEW

Chapter II, Literature Review section continues by providing background and knowledge base the study's major themes about fertilizer usage and changes over time. This section provides a thematic review of the study on fertilizer usage and history of shifts to chemical fertilizer from use of organic fertilizers. The research further enhances its credibility by incorporating the Stimulus and Response (SR) theory to provide a strong foundation.

Agriculture and its Importance in Nepal

Nepal's population depends highly on agriculture for their livelihoods and the country's economy. It serves as the foundation of Nepal's rural economy, employing over 65% of the labor force and contributing roughly 23.95% of the nation's GDP as per the data of 2021/22 by Economic Research Department of Nepal Rastra Bank (Nepal Rastra Bank , 2021).

Agriculture provides employment to a large percentage of the Nepal population, particularly in rural areas where other forms of employment are limited. As stated in the Investment Board Nepal 2024, there are more than 60% of the populations of Nepal who are engaged in agricultural purposes, directly or indirectly. The agricultural sector here in Nepal serves as a primary source of income and livelihood for most rural households, underpinning the socio-economic fabric of Nepalese society (Asian Development Bank [ADB], 2007).

Agriculture is a key component of feeding the growing population in Nepal, which is placing more strain on food production in this country than in the past. If agriculture does not become more efficient, many rural communities will increasingly face food deficits and hunger. By adopting better farming methods, including careful use of fertilizers and eco-friendly practices, farmers can protect the soil and grow enough food to meet the needs of the country (Arun & Ghimire, 2017). Traditional agricultural practices, passed down through generations, reflect a profound understanding of the land, the climate, and the intricate cycles of nature (Pretty, 2013). These practices are deeply entwined with local customs, religious beliefs, and communal life, shaping not only the economy but also social cohesion in rural communities (Adefila et al., 2024). Agriculture in Nepal is deeply intertwined with

ritual and spirituality. Festivals mark important stages of the farming calendar and reinforce communal solidarity. *Maghe Sankranti*, for instance, signals the start of the winter harvest, while Dashain and Tihar include offerings to gods and ancestors for a successful cropping season.

In addition to being the backbone of the national economy, Nepal's agriculture plays a significant role in job creation, food security, and cultural identity. A new model that blends contemporary techniques with environmental sustainability will be required for long-term economic" sustainability and efficiency.

Importance of fertilizers and Change in Fertilizer use Practices in Nepal

In countries like Nepal, the primary economic activity is agriculture, and fertilizers are important to current agricultural practices because they increase crop yields significantly and increase food security. Fertilizers play an important role in agricultural development, particularly in regions where soils are deficient in nutrients. Fertilizers can replenish soil nutrients, or nutrients used up by cropping, such as potassium, phosphorus, and nitrogen, which are all needed in healthy crops (Burtan et al., 2018). Fertilizers are required to maintain and increase crop production in Nepal, which is a considerable share of the land as rice, maize, and wheat are grown. Fertilizers are a key component in agriculture to raise farmer productivity and sustain food availability as food production is reaching a pressing global demand to meet the growing populations.

Fertilizer application has dramatically changed in Nepal over the last few decades. Organic fertilizers, like compost and animal dung, have been primarily used by Nepali farmers in the past to enhance their soil. Farmers have used these traditional practices for centuries to maintain soil fertility and care for the ecosystem.

The use of chemical fertilizers in Nepal started in 1952, primarily through imports, as Nepal lacked the technological capacity to produce its own fertilizers (Vista et al., 2022). The Green Revolution, which occurred in the 1960s and 1970s, also increased the use of chemical fertilizers in Asia. Using higher-yielding types of crops, particularly in rice farming, increased demand for chemical inputs to improve productivity. This increase in agricultural production, enabled by chemical fertilizers, provided Nepalese farmers with the means to address the food needs of a growing population (Aryal et al., 2021). The transition to using chemical fertilizers was

considered a necessary step to meet the demands of population increase and agricultural production (Ghimire & Dhakal, 2021).

Even with an increasing demand for food, and continued dependence on chemical fertilizers to maintain agricultural production, Nepal has begun making changes to improve agricultural practices by moving toward sustainable agricultural practices. A key consideration for enhancing fertilizer-use conversion efficiency is the integration of soil testing, precision agriculture, and organic fertilizers (Aryal et al., 2021). In this light, Nepal is evolving its fertilizer utilization practice from one in which chemical inputs carry a large reliance towards a more environmentally aware and balanced approach. We have learned time and again in recent years that it is important to consider the benchmark between chemical fertilizers and organic fertilizers to ensure the sustainability of soils and their future health. The Agriculture Development Strategy (ADS) 2015-2035 has been a principal policy that has supported nutrient management by also integrated chemical and organic fertilizers (Ministry of Agriculture and Livestock Development [MoALD], 2015). This policy advocates that farmers increase their practice to support soil fertility by using chemical fertilizers and not promoting concerns with too much chemical fertilizer use have a negative environmental consequence.

Influencing Factors behind Fertilizer Change

As indicated by Zhou et al. (2010), farm size, irrigation access, and distance to fertilizer markets are noted as limiting factors for farmers' ability to intensively apply fertilizer. Farmers' decisions to apply more or less fertilizer are also heavily influenced by their own experiences and opinions. This is relevant to our research since it also addresses farmers' experiences and knowledge regarding a particular fertilizer.

The study by Aryal et al. (2021) looks at the factors that affect farmers' use of inorganic and organic fertilizers in South Asia, mostly in Nepal. They found that the type and amount of fertilizer used are also affected by several factors, including the education level of the farmer, access to loans, farm size, and how far from the market the farmer is located. For example, farmers had a greater possibility of using balanced fertilizers that included organic and inorganic fertilizers if they had more cash in hand and knowledge. This research assisted the research being undertaken in the Godawari Municipality of Nepal, when a survey was conducted to explore similar variables of

market access, amount of landholding, organic and inorganic farming, and education. These arguably ensure better fertilizer management in Godawari, with increased productivity and less environmental impact, through the improvement of education and financial support to farmers.

Johnson et al. (2013) researched the effect of nitrogen fertilization on seed yield, nitrogen uptake, and nitrogen use efficiency in the Canadian crop *Brassica carinata*. Compared to the control, higher nitrogen rates resulted in generally higher seed yield and nitrogen uptake, however, increased nitrogen rate resulted in nitrogen use efficiency being significantly decreased. This applies to the study when respondents were asked crop productivity associated with nitrogen rates differing seed rates and nitrogen rates.

Likewise, Micha et al. (2023) explores the effects of soil-testing practices on fertilizer practices within Irish dairy farmers. The survey finds out that farmers who generally perform soil tests use less chemical phosphorus fertilizer, reducing the environmental impact while maintaining healthy soils. Similarly, the study conducted by (Diiro et al., 2018) study on the impact of gender on fertilizer adoption in Uganda offers valuable insights that are pertinent to the current study in Nepal's Godawari Municipality. The study found that farms with male and female heads have different motivations for using fertilizer. For male household heads, age, non-farm income, and professional visits that provided information and training regarding modern farming practices, crop management, and other agricultural practices emerged as important factors, while education and access to markets emerged as important factors for female heads of households

Zhang et al. (2016) states that the factors contributing to the high use of nitrogen fertilizer in the Liangzihu Lake basin in Central China included low production on-farm, the degree of reliance on off-farm income, and lower levels of education. Again, these results fit our questionnaire which examines fertilizer use and sources if income, size of land, and education. Also, since they have less time to manage their farms, farmers with more off income usually apply more fertilizer, which is an example of a finding that is relevant to our area according to the report. Furthermore, Zhang et al. note that poor management of fertilizers relates to farmers' knowledge of soil fertility and fertilizer quality issues. The study we did is also addressing this aspect. Therefore, expanding technical training and education could

effectively motivate Godawari Municipality to apply sustainable fertilizing methods. The survey includes related topics, such as soil fertility maintenance practices and types of fertilizers. Both studies also identify the challenges, widespread among farmers, of optimizing fertilizer use in agriculture, while stressing the importance of farmer educational opportunities and manure management practices not only to enhance soil health but also to increase crop productivity.

ZHU et al. (2022) examined the relationship between farm size and fertilizer use efficiency in China, and they provide suggestions that may apply to our study in Nepal. They found that fertilizer use efficiency is greater with farm size (versus small farms) and bigger farms produce more fertilizer. This is relevant for the Nepal study, as both agriculture practice and landholding size are examined in the same questionnaire. If Nepal can increase fertilizer efficiency by using better agriculture practices, it will benefit them, and maybe even by growing farm size. It is in preventing environmental degradation while maintaining good agricultural output, and it will investigate how farmers manage soil fertility and fertilizer application.

Policy Review on Fertilizers in Nepal

An essential component of agricultural output is fertilizer. Comparably, of all the policies pertaining to agriculture, the fertilizer policy is also essential. The policy has evolved over time, though. For a long time, Nepal has struggled to meet the demands of farmers by providing timely, high-quality fertilizer. Only 25% of farmers receive fertilizer at a discounted price in the fiscal year 2017, despite the fact that farmers' total fertilizer demand was close to eight lakh metric tons (MoALD, 2015).

Increasing crop production, productivity, commercialization, and competitiveness is the overarching purpose of Nepal's agricultural policies, which are based primarily on the National Agriculture Policy-2004 (NAP-2004) (Arun & Ghimire, 2017). The academic researcher in this case considers agriculture to be the primary means for increasing crop yield and discusses the significance of on-time distribution and monitoring of chemical fertilizer to enable agricultural growth. In addition, they indicate that the NAP–2004 encourages private investment in the construction of chemical fertilizer plants, consistent with its goal of fostering agricultural entrepreneurship.

Commencing in 1995/96, the Agriculture Perspective Plan (APP) was a 20-year long development initiative and was successful in researching NAP-2004 and

addressing the impacts of soil fertility and agricultural productivity on national priorities Thapa et al. (2023). APP made some progress, but ultimately faced challenges and did not achieve its intended aims, emphasizing that agricultural inputs are crucial for stimulating a change in this sector (APP). Thapa et al. (2023) inferred that appreciable success was achieved in accomplishing intended goals in soil fertility and productivity, relationships were not fully met. This implies that APP would not be the ultimate resolution.

To address the limitations of previous policies, the Agriculture Development Strategy (ADS) 2015–2035 was launched as a comprehensive framework for the agricultural sector (MoALD, 2015). The document provides a thorough explanation of ADS, emphasizing an integrated approach related to the distribution, efficiency, sustainability, and accessibility of chemical fertilizer usage across the country. It also identifies barriers in the commercial and public sectors (such as illegal supply chains or access to limited fertilizer), and methods to navigate those barriers. The document also outlines how, to improve fertilizer distribution and application practices at the farmer level, ADS has introduced new approaches to integrated monitoring and evaluation within input management (MoALD, 2015).

The need for sustainable agricultural practices that mitigate the dependence on chemical fertilizers has initiated a slow shift in Nepali policy initiatives towards organic agriculture. The Tenth Five-Year Plan enhanced the measures for organic agriculture practices as a response to the negative impacts of agrochemicals, officially making organic agriculture a priority. While a shift in regulatory structure is in place, farmers are moving away from reliance on chemical fertilizers towards using organic agricultural practices that promote organic fertilizers. Support for organic certification and, more recently, for the development of organic manure, have helped farmers move into a more integrated approach that uses chemicals and organic inputs. Since 1995 and until 2015, Nepal's agricultural policy had prioritized infrequent use of limited inputs, where the emphasis was on mostly non-organic practice (Pokhrel & Pant, 2009). Plans and strategies focused on these policies, with support for organic agriculture being minimal.

The principles of organic agriculture correspond to the constitution of Nepal, 2015, particularly with respect to food rights, food sovereignty and sustainable food production as established in Schedule 36. Further, the entailments of Nepal's

commitment to the Sustainable Development Goals (SDG) encourage the advancement of organic agriculture with the goal of enhancing biological diversity, climate adaptability and common land. The SDG correspond with goals for enhancing productivity and sustainability in Nepal by 2030. The priority domains of SDGs 2 and 12 promote increased genetic diversity through seed banks and sustainable food systems; as well as tripling food production (Baral et al., 2020). SDGs 13-15 also support organic agriculture by promoting climate-friendly agriculture and terrestrial conservation and sustainable use of land (Baral et al., 2020).

Changes in fertilizer policies in Nepal have had a significant impact on farmers' fertilizer use practices. Policies such as the National Agriculture Policy-2004 (NAP-2004), highlights that fertilizer usage in agricultural activities across the country was affected the Agriculture Development Strategy (ADS) 2015–2035, and Agriculture Perspective Plan (APP). For example, in terms of fertilizer, the National Agriculture Policy-2004 was to advocate for private investment in chemical fertilizer factories and recognized the importance of improving crop production by providing fertilizer on time. In response, organic fertilizing practices and styles were phased out for more systematic and supervised systems using chemical fertilizers. New regulations of these modern fertilizers urged farmers to use them more often in hopes of improving crop quality, sometimes relating to national agricultural standards.

Theoretical Review

Due to the population's increase and hunger for food crops, farmers are increasing the amount of fertilizer used to fulfill consumer demand. The preeminent part of filling demand and maintaining farming is applying too much chemical fertilizer to increase yields. Therefore, it is conceptualized through the theoretical analysis model of Stimulus Response (S-R).

Stimulus-Response (S-R) Theory

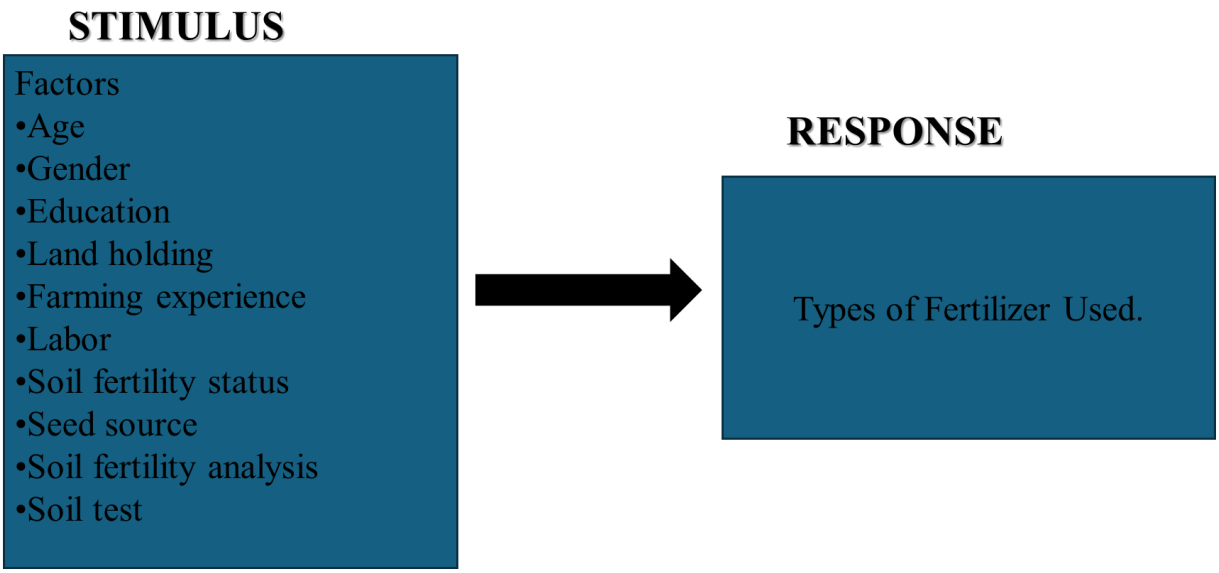
The conceptual framework of this study is built upon the Stimulus-Response Theory, which defines how people react to internal and external stimuli through observable behavior. This study found that a number of sociodemographic, economic, and environmental variables (stimuli) influence farmers' fertilizer usage behavior (response), dictating how and why their fertilizer practices evolve. The framework shows how farmers' personal and social qualities, which impact their

agricultural decisions, are represented by independent variables such as age, gender, education, landholding size, and farm experience.

Conceptual Framework

Figure 1

Conceptual Framework



The conceptual framework was first was developed by reviewing the literature on fertilizer use practice. The key demographic, socio-economic and agronomic factors associated with farmer's fertilizer use practices were then identified. These factors – such as age, gender, education, landholding, farming experience, labor, soil fertility status and access to inputs were aligned with the central outcome variable – the types of fertilizer used (organic, chemical or a hybrid).The model synthesizes the elements by illustrating how these external factors act as determinants that shape farmer's fertilizer choices. Therefore, this structured representation helps explain the pathways through which different characteristics influence fertilizer use practice in context of Godawari municipality.

The framework of this study is based on the Stimulus-Response Theory, which describes how people respond to internal and external stimuli through apparent behavior. This study demonstrated how and why farmers' fertilizer usage habits (responses) change in response to a variety of sociodemographic, economic, and environmental conditions (stimuli). The framework depicts how socio-economic factors such as age, gender, education, landholding size, and farming experience visualize the personal and social characteristics of farmers that impact their

agricultural choices. The theory describes how numerous variables influence farmers' fertilizer decisions, including market dynamics, environmental constraints, and regulatory changes. By directly correlating these external stimuli with farmers' responses, we may better understand the basic reasons for changes in fertilizer usage patterns and identify the most relevant factors (Li-hua et al., 2022; Zhang et al., 2016).

The S-R theory is significantly impactful in areas like Godawari Municipality, where farmers are regularly affected by changing external factors. For instance, the S-R framework would forecast a rise in the usage of organic fertilizer if the government implemented new subsidies for organic farming. When policymakers are trying to create policies that promote sustainable farming practices, this knowledge of causes and effects can be quite helpful (Aryal et al., 2021; Dong et al., 2022).

Research Gap

While much literature does indeed exist on the application of fertilizers and its impacts on agricultural productivity, there is a considerable gap in the studying number of socio-economic factors, such as age, gender, and education, among other things, affecting fertilizer use by smallholder farmers in Nepal. Most available literature tends to dwell either on the environmental effects of inorganic versus organic fertilizers or general trends in agricultural productivity, hence overlooking the significant role that demographic variables play in shaping farmers' decision-making processes(Miah et al., 2019). That is, very few studies have thus far examined how socioeconomic factors of farmers affect fertilizer adoption and use in Godawari Municipality of Nepal. This gap is of particular importance in a country like Nepal, with its variety of social structures, economic conditions, which can really affect farming practices (Aryal et al., 2021).

This study addresses the research gap by examining the socio-economic determinants of fertilizer use among farmers in Godawari Municipality, Nepal, providing insights into how factors such as age, gender, education, landholding size, and access to resources influence fertilizer use practices. This study will witness the development of practical insights for policymakers and agricultural stakeholders on how best to design targeted strategies to promote sustainable and inclusive agricultural practices. This research will bridge the gap and, therefore, contribute to

the greater objective of fostered, sustainable agricultural development in Nepal and relating to regions where socio-economic diversity is dominant in farming.

CHAPTER III
RESEARCH METHODOLOGY

This research adopts quantitative approach to examine the shifts in fertilizer use Practices among farmers in Godawari Municipality, Kailali, specifically within Ward No. 1. In this research study, I have employed methods that are tailored to the research objectives, prioritizing the investigation of fertilizer use Practices and the factors affecting their changes.

Quantitative Research Design

As the study focuses on finding out the factors that impact the changes in fertilizer use Practices of farmers, the only reasonable approach is to incorporate the descriptive statistics and inferential statistics (Chi- square test) to further check the hypotheses and its significance. Hence, the survey and collected data is justified through the incorporation of statistical tools, precisely with the help of descriptive and inferential statistical analysis process, later presented with facts and figures and their tactful analysis and description.

Survey Design

In order to thoroughly examine farmers' changing fertilizer usage practices, this study used a quantitative survey design. The survey instrument was created especially for this study by combining components from well-established research and measuring instruments that have already been proven to work. Twenty well-crafted semi-structured questionnaires make up the survey, which is divided into three subject sections: (1) the respondents' demographics, (2) the agricultural methods they now use, and (3) their degree of technical farming expertise. To capture farmers' unique viewpoints and qualitative insights beyond the prescribed responses, these questionnaires included a number of closed-ended questions and a small number of open-ended questions. The methodical gathering of pertinent and trustworthy data to meet the goals of the study was guaranteed by this methodical methodology.

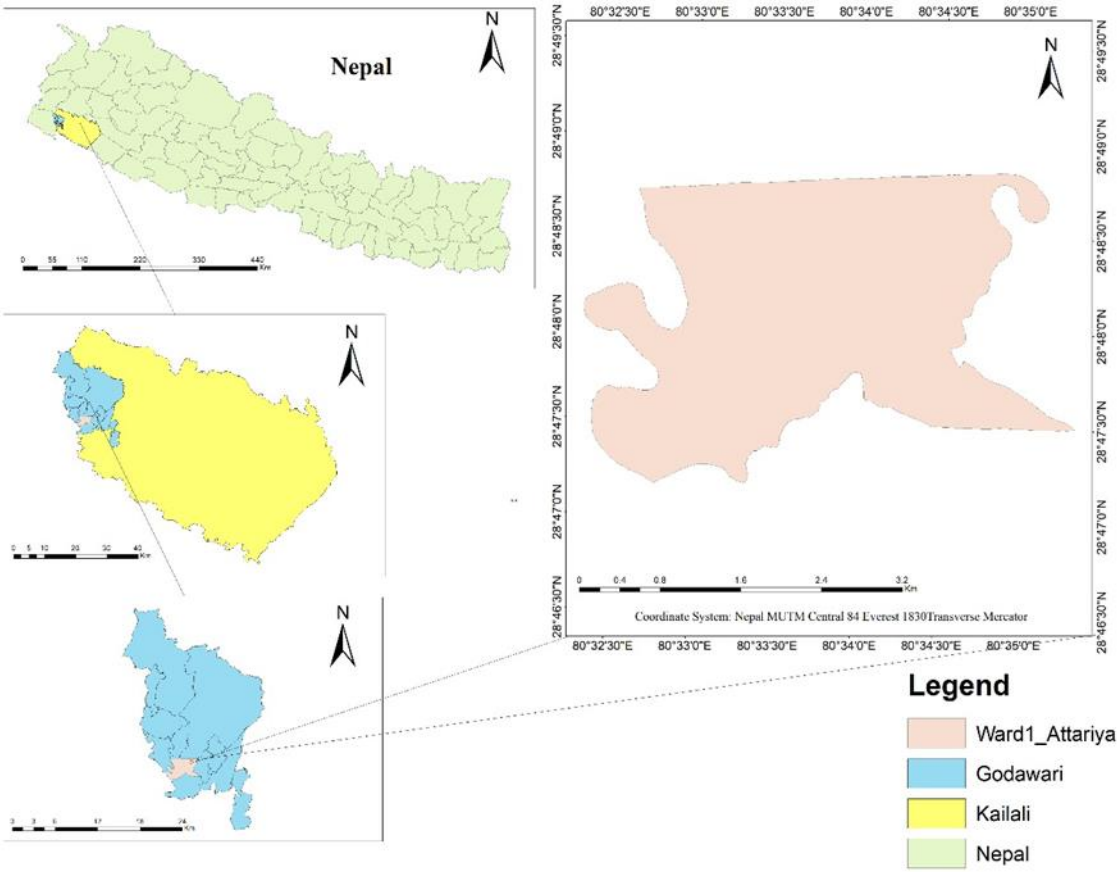
Study Area

This study was carried out in Godawari Municipality, Ward-1 Attariya, Kailali district in the Far-Western region (Province No. 7) of Nepal. The municipality is known for its ethnically and socio-culturally heterogeneous population and is a major agricultural center in the area. A relatively high level of farming practice is carried out

by the local population, and it is an excellent case study area for analyzing changes in farmers' fertilizer use. Godawari Municipality was chosen purposively due to its potential to offer a broader perspective of changing agriculture practices including use of fertilizers.

Figure 2

Map of Study Area



The evolving agricultural setting of this region provides a valuable opportunity to study how farmers are modifying their practices over time. Therefore, this research intends to examine and assess the trends of fertilizer application in Godawari Municipality, focusing on the importance of fertilizers in modern agriculture in this locality.

Population/ Sample Design

The farmers who live in Godawari Municipality's Ward No. 1 are the sole subject of this study. The ward profile states that there are 8,531 people living in the region overall, with about 88% of them working in agriculture. In order to cover a range of generational perspectives, the study sample is made up of farmers who are between the ages of 25 and 75. This sample design guarantees that thorough data and

information are gathered from all persons actively involved in farming, ranging from young adults to those who have worked in agriculture their entire lives and have a significant role in this food chain ecology.

Sampling Process

The target population was reduced to only include economically active people, who were designated as those between the ages of 25 and 75, in order to guarantee relevance to the study's goals. This age group represents around 6,711 persons, or 78.67% of the entire ward population.

The vast majority of this economically active group, roughly 88% work in agriculture, suggest that farming and related activities are their main source of income. As a result, 5,906 people make up the agricultural population, which serves as the study's actual sampling frame.

To calculate a suitable and statistically representative sample size, Cochran's formula was used. This formula is widely used to calculate sample size in huge populations; however, it is modified here to account for a finite population. The formula is given as:

$$n_o = \frac{Z^2.p.(1-p)}{e^2}$$

Where:

n_0 = initial sample size for an infinite population

Z = 1.96 (Z-value for a 95% confidence level)

p = 0.5 (estimated proportion, used for maximum variability)

e = 0.05 (desired margin of error)

Substituting the values:

$$n_o = \frac{(1.96)^2 \times\ 0.5 \times (1-0.5)}{(0.05)^2}$$

$$n_o = \frac{3.8416 \times 0.25}{0.0025}$$

$$n_o = 384.16$$

Given the finite population size of 5,906 agricultural persons, the sample size is corrected using the finite population adjustment formula:

$$n = \frac{n_o}{1 + (\frac{n_o - 1}{N})}$$

$$n = \frac{384}{1 + (\frac{384 - 1}{5906})}$$

$$n = \frac{384}{1.0649}$$

$$n \approx 360.7$$

As a result, the final sample size for this study is 361 respondents, which ensures appropriate representation while retaining statistical rigor.

Data Analysis

The data from the 361 surveys is analyzed using SPSS statistical software. This analysis enabled the use of a variety of statistical tests and procedures to investigate the relationships between variables and validate the reliability and accuracy of the results. SPSS enabled a thorough examination of the factors influencing the changing practices of fertilizer use among

farmers in Godawari Municipality. This study used descriptive statistics and non-parametric test (Chi- square test) for testing the hypotheses.

Reliability

The reliability of the questionnaire was preserved by modifying it from previously validated research conducted in a comparable agricultural environment. Using a uniform data collecting technique, the researcher guaranteed that all 361 respondents provided consistent data during the study. Using a standard set of questions increases our confidence that the data we collect will be accurate and dependable. This approach helps ensure that our findings are consistent and can be compared with previous research. Reliability was reinforced by pre-testing the questionnaire to confirm clarity and consistency in respondents' understanding of questions, ensuring measurement stability across respondents. Since the data was factual, I used test-retest method of reliability (Landis & Koch, 1977). First, the instrument was sent to 40 respondents and data was collected. After that, the questionnaire was sent to same respondents after 10 days and collected data again. The name, address and contact number of the same group of farmer's was contacted.

This helped to accurately identify and track the same respondents in the second round. Once the second phase of response was collected, the answers from both phase were matched carefully for each individual. These responses were then paired item by item and Cohen Kappa (K) was calculated manually to access the level of agreements between the two time points. This process ensured the reliability estimate truly reflected the consistency of responses from the same participants over time. The formula used for this is

$K=(P_0-P_e)/1- P_e$

Where P_0 is observed proportion of agreement and P_e is expected proportion of agreement by chance.

The value of K was 0.66 ensuring substantial internal consistency (Landis & Koch, 1977). The calculation of internal consistency of one of the items is shown in ANNEX 3

Validity

Validity is a measure of how well a measuring instrument fulfills its intended purpose and pertains to whether the instrument measures the behavior or quality that it is designed to measure (Anastasi & Urbina, 1997).

Content Validity

The questionnaire designed for the factors influencing farmers' decisions to apply fertilizer was used in this study to guarantee content validity. Professors and academic supervisors from Kathmandu University provided knowledgeable advice during the assessment and improvement of the questionnaire. The questionnaire was designed to comprehensively examine all of the characteristics that influence fertilizer usage, such as age, gender, education, landholding, soil fertility, and resource accessibility. The questionnaire's question selection was informed by literature reviews and previously authorized research methods, ensuring that it encompassed all relevant aspects of fertilizer usage behavior.(Brink, 1993).

Construct Validity

The adapted questionnaire aligned closely with the conceptual and theoretical framework of the study (Stimulus–Response theory). Each question was designed to represent constructs such as farmers’ attitudes, knowledge, and decision-making processes concerning fertilizer use. Statistical testing (Chi-square) validated that the

constructs measured (e.g., relationship between age, land size, knowledge, etc.) acted as theoretically predicted (Barten et al., 2012).

Criterion Validity

Criterion validity is the degree of agreement between the questionnaire's findings and other recognized metrics or outcomes (Whittemore et al., 2001). The questionnaire's outcomes were compared and aligned with results and trends observed in previous empirical studies on fertilizer use in Nepal and South Asia. Criterion validity is essential in this study because it confirms that the questionnaire not only measures what it is supposed to measure but also correlates with key criteria or standards, providing a solid foundation for the interpretation and application of our results (Whiston, 2012).

Ethical Consideration

To maintain the integrity of this study on farmers' evolving fertilizer use practices, ethical issues are crucial. (Resnik, 2018) underlies the research on principles of human dignity, individual rights, and reverence for cultural mores and values. Transparency was stressed at every stage. Study, which was conducted exactly within ethical standards(Israel & Hay, 2006). Top priority is respecting the freedom of participants, protecting their privacy, and securing informed permission. Data confidentiality was rigorously maintained, and farmers were able to either join or leave from the program without experiencing any negative effects (Sumathipala & Siribaddana, 2003). Ensuring ethical data collection, transparency, and sincerity during the research process help to establish trust with participants. These ethical measures while promoting cooperation and improving the study's reliability and trustworthiness were also critical in maintaining moral standards. I sincerely value the input of the farmers and local respondents, the individuals that backed my fieldwork during the course of my investigation. In addition to general research ethics, the study was conducted in accordance with the ethical guidelines of the Kathmandu University School of Education (KUSOED). These guidelines emphasize informed consent, voluntary participation, protection of privacy, and respect for the dignity and autonomy of participants. Prior to data collection, the purpose of the study was clearly explained to all respondents, and verbal consent was obtained in alignment with KUSOED’s field-based research protocols. Participants were assured that their responses would remain confidential and used solely for academic purposes.

CHAPTER IV
DATA ANALYSIS

The data gathered from farmers in Ward 1, Godawari Municipality, Kailali is analyzed and interpreted in this chapter. First, the survey participants' sociodemographic and socioeconomic profile is described, and then their fertilizer use patterns are analyzed. The connections between important traits like age, gender, education, the size, the kind of fertilizer used, and the agricultural expertise, and land ownership are analyzed using descriptive statistics (frequencies, percentages) and inferential statistics (Chi-square tests). The results are examined in line with the study's goals and hypotheses in order to gain a better understanding of the elements that are driving the shift in trends. the application of fertilizer in the research region.

Table 1

Socio-Demographic Data

Category		Frequency	Percentage
Gender			
	Male	270	74.8
	Female	91	25.2
Age			
	25-35 years	32	8.9
	36-45 years	103	28.5
	46-55 years	154	42.7
	56 and above years	72	19.9
Education Status			
	Bachelor and above	64	17.7
	Higher Secondary	115	31.9
	SLC	103	28.5
	Primary level	79	21.9
Land Holding			
	1-5 Kathha	226	62.6
	More than 5 Kathha	135	37.4
Farming Experience			

	1-10 years	204	56.5
	11-20 years	48	13.3
	Above 20 years	109	30.2

Table 1 provides an overview of the socio-demographic characteristics of the respondents from Godawari Municipality Kailali, focusing on gender, age, education status, landholding, and farming experience.

The sample shows a strong gender imbalance with males comprising 74.8% of respondents versus 25.2% females, reflecting male dominance in the farming population. The age distribution indicates that middle-aged individuals (36-55 years) form the primary agricultural workforce at 71.2%, while younger farmers (25-35 years) represent only 8.9%. This aging demographic suggests challenges in attracting young people to farming and potential resistance to modern agricultural practices, as older farmers may prefer traditional organic methods while younger ones are more open to innovation.

With 31.9% having completed higher secondary education, 21.9% having completed primary education, and 17.7% possessing a bachelor's degree or above, educational levels differ significantly. The ability of farmers to use contemporary fertilization methods and obtain extension services is directly impacted by this variability. Due to their limited finances and tendency to prioritize short-term chemical fertilizers over long-term investments in soil health, the majority of farmers (62.6%) are smallholders with 1–5 Kathha of land. There is a mix of traditional farmers and those who might be more open to new approaches, with 56.5% having 1-10 years of experience and 30.2% having more than 20.

These socio-demographic characteristics significantly influence fertilizer choices in the region. Sustainable agricultural programs must account for these demographic variations-addressing gender gaps, educational disparities, resource limitations of smallholders, and the balance between traditional knowledge and modern practices, to effectively promote integrated organic and chemical fertilizer use. Programs should take these demographic differences into account when merging modern farming practices with chemical and organic fertilizers in order to increase adoption.

Table 2

Status of Fertilizers Used

Category		Frequency	Percentage
Organic		64	17.7
Chemical		98	27.1
Both		199	55.1
Gobar Organic Manure			
	Yes	217	60.1
	No	144	39.9
Compost Organic manure			
	Yes	129	35.7
	No	232	64.3
UREA			
	Yes	295	81.7
	No	66	18.3
DAP			
	Yes	259	71.7
	No	102	28.3
Potash			
	Yes	133	36.8
	No	228	63.2
Zinc			
	Yes	119	33
	No	242	67

Table 2 provides a comprehensive overview of the types and specific forms of fertilizers used by farmers in Godawari Municipality, revealing important insights about fertilizer practices and preferences in the area. According to the data, a large number of farmers employ integrated nutrient management techniques. 55.1% of farmers use a mixed fertilizer strategy, which blends conventional and organic fertilizers. While smaller proportions rely exclusively on chemical fertilizers (27.1%) or solely on organic fertilizers (17.7%) reveal important insights into farming priorities and resource access. The higher number of chemical-only users than

organic-only users indicates that chemical fertilizers have gained widespread acceptance, most likely due to their immediate, visible effects on crop growth and yield increase. It does not imply that farmers are using chemical fertilizers at excessive levels, but rather that a larger share of farmers include chemical inputs in their fertility management practices.

In terms of organic fertilizers, the region's considerable integration of agricultural and animal production systems is shown in the 60.1% use of Gobar, or cattle dung. This procedure demonstrates how animal dung can be efficiently converted into crop fertilizer through the continued application of conventional sustainable farming techniques. However, only 35.7% of participants use composted organic manure as fertilizer, and 64.3% do not use organic manure at all. This could indicate that the difference in composting facilities or knowledge is not available, or simply a preference for the more accessible organic manure-namely Gobar. Chemical fertilizers, UREA is rated as the most applied type by 81.7% of the respondents. This high proportion indicates that UREA has an important role in increasing agricultural yields, particularly in nitrogen-deficient soils.

This also tends to reflect the general availability and, perhaps, even government subsidies for this type of fertilizer within the region. Thus, in this aspect, 71.7% make use of DAP, or Diammonium Phosphate, further revealing their reliance upon chemical fertilizers to meet crops' needs, which, in this case, is phosphorus. Other chemical fertilizers used but less frequently applied include Potash and Zinc. The frequency of use for Potash is 36.8%, and for Zinc, it is 33%. These relatively lower frequencies of application may be partly due to the cost or lack of information about the particular benefits that those nutrients-LESS-commonly known, such as potassium and zinc-provide for plant health. The table is, therefore, representative of a farming community that is predominantly relying on chemical fertilizers.

Figure 3

Age of Respondents*Fertilizer Used

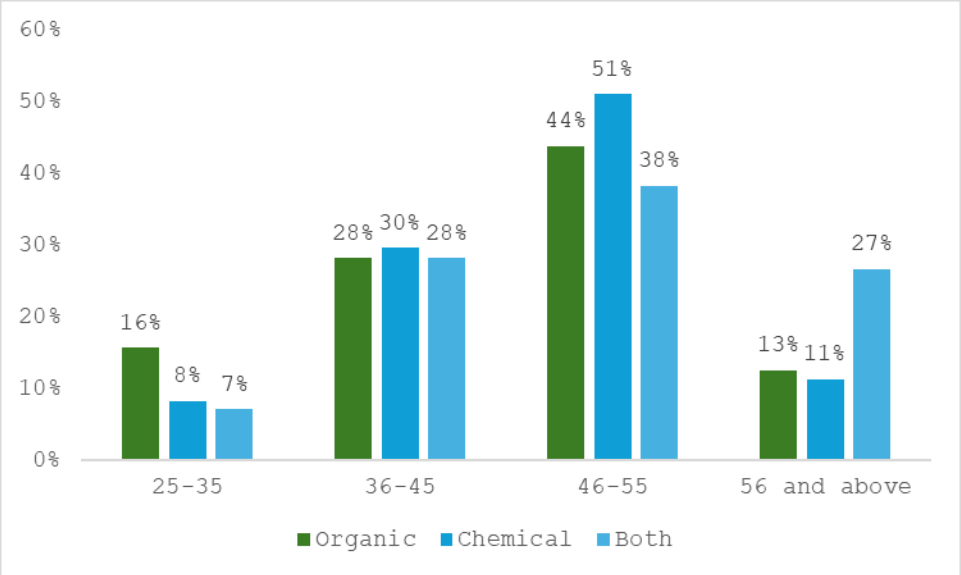


Figure 3 reflects significant differences in fertilizer usage across different age groupings of farmers. The youngest age group, 25 to 35 years old, is pretty evenly split, with ten using organic fertilizers, eight using chemical fertilizers, and fourteen using both. This might imply that younger farmers are still experimenting with various sorts of fertilizers, indicating an openness to contemporary techniques alongside ecological ones. A remarkable shift can be observed towards the use of both organic and chemical fertilizers in the middle age groups, i.e., 36-45 and 46-55 years. In the 36-45 age group, 56 respondents belonged to the category using both, while 29 depended entirely upon chemical fertilizers and 18 used organic. This trend becomes very prominent when, in the 46-55 group, as many as 76 respondents used both fertilizers, showing a preference for combining traditional and modern methods to enhance productivity. This may reflect the practical experience of these farmers, because these farmers balance between soil health and yields.

The oldest group-56 and above, relies more on the use of both types of fertilizers, 53 respondents favor this method. Looking at the farmers in this older age group who use only chemical and organic fertilizer in farming few times compared to the combined approach, 11 use only chemical while 8 use organic fertilizer. The chi-square test was used to determine whether there is a significant difference between respondents' ages and their fertilizer consumption practices. The test findings demonstrated a statistically significant difference between age and fertilizer use (χ^2 =

18.25,6, p = 0.006), showing that age is an important factor determining the kind of fertilizer used by farmers in the research region. Older and middle-aged farmers are more likely to use both organic and chemical fertilizers. Therefore, this Practices signifies that farming is an adaptive occupation whereby at an older age, farmers combine traditional knowledge with modern techniques in managing agricultural activities for better productivity levels.

Table 3

Gender of Respondents*Fertilizer Used

		Organic	Chemical	Both	Total
Gender	Male	36	77	157	270
	Female	28	21	42	91
Total		64	98	199	361

Table 3 describes the use of fertilizers, comparing the gender of the respondents. As indicated, male farmers use organic fertilizers by a frequency of 36, chemical fertilizers by 77, and both by a frequency of 157; the Practices is different when it comes to female farmers: 28 females use organic, 21 females use chemical, and 42 females rely on both. The totals across each category give: Organic 64, Chemical 98, using both fertilizers, 199.

One conspicuous observation from the table is that male farmers who apply chemical fertilizers are in higher proportions, 77 to 21 female farmers. This would suggest that either men have better access to such resources or are more willing to adopt chemical fertilizers in pursuit of higher yields, whereas women may be more constrained in their access to such inputs or may simply prefer more traditional forms of farming. On the other hand, 157 male and 42 female respondents use both organic and chemical fertilizers as complementary means, which, again, shows that balance could be enabled throughout.

The Chi- square test revealed a statistically significant difference between gender and the types of fertilizer used ($\chi^2 = 14.190$, 2, $0.001 < 0.05$).This suggests that fertilizer use practice differ between male and female farmers. Male farmers were more likely to use chemical fertilizers whereas, female farmers showed a comparatively higher use of organic fertilizers. These factors may represent the underlying gender differences in access to resources, decision making roles, and farming preferences. Such findings highlight the need for gender responsive

agricultural support and interventions. This will help to ensure equitable access to sustainable fertilizer options.

Table 4

Education of Respondents*Fertilizer Used

		Organic	Chemical	Both	Total
Education status	Bachelor and above	12	12	40	64
	Higher Secondary	18	36	61	115
	S.L.C	18	27	58	103
	Primary Level	16	23	40	79
Total		64	98	199	361

Table 4 describes the distribution of use of fertilizer by the educational levels of the respondents can be sorted into four categories: Bachelor and above, Higher Secondary, S.L.C. (School Leaving Certificate), and Primary Level. Out of the total respondents at the level of Bachelor and above, 12 use organic fertilizers, 12 use chemical fertilizers, while 40 use both types. The intention of using both fertilizers is also higher for the respondents with Higher Secondary education; 61 out of 115 respondents have opted for this combination.

For the respondents with S.L.C qualifications, the usage of both organic and chemical fertilizers is 58, chemical fertilizers by 27, and that of organic fertilizers by 18. The practices look rather similar among those with only Primary Level education in which 40 use both fertilizers, 23 use chemicals, and 16 use organic fertilizers. Overall, at all levels of education, respondents prefer a combination of both organic and inorganic fertilizers, though relatively few use exclusively organic or chemical fertilizers.

The Chi- square test of ($\chi^2 = 4.182,6, 0.652 > 0.05$) is not significant, and hence education does not significantly explain the types of fertilizers farmers have chosen to use. This points out that other variables like farming experience, access to resources, and size of the land are much more significant in determining fertilizer use. Farmers with different ranges of schooling seem to converge to quite similar practices, as most farmers use both organic and chemical fertilizers in some combination, presumably as a balancing behavior between sustainability concerns and productivity.

Table 5

Land Holding* Fertilizer Used

		Organic	Chemical	Both	Total
Land holding (Kattha)	1- 5	56	58	112	226
	more than 5	8	40	87	135
Total		64	98	199	361

Table 5 represents the relation between the size of land held in Kathha and the type of fertilizer used by the farmers. The respondents have been divided into two groups: holders of 1-5 Kathha and holders of more than 5 Kathha. The table reflects that farmers owning 1-5 Kathha use organic fertilizers 56 times, chemical fertilizers 58 times, both 112 times. This denotes the balancing act on the use of fertilizers among smallholders, with a slight leading towards the application of both kinds of fertilizers.

In contrast to this, farmers with larger areas of land holding more than 5 Kathha use both types of fertilizer by 87 respondents, 40 use chemical fertilizers, and only 8 use organic fertilizers. This suggests that larger landholders may favor high production returns and possibly rely more heavily on chemical fertilizers as a means of rapidly boosting productivity, rather than using organic fertilizer. On the other hand, the high use of both organic and chemical fertilizers could suggest that even larger landholders can see certain advantages of incorporating organic methods to help maintain soil health and sustainability, with 87 respondents in this group across both fertilizer types.

The chi-square test statistic ($\chi^2 = 20.831, 2, 0.000, <0.05$). It means that there is indeed a significant difference in fertilizer use with regard to landholding size. Thus, it can be established that the size of landholdings is a very important determinant of the type of fertilizers used. Farmers with larger pieces of land are more likely to use chemical fertilizers, perhaps because they are able to invest in the usage of these inputs, while smallholders use organic and chemical fertilizers in a much more balanced manner. This infers that land size shapes farming methods, with larger farms emphasizing productivity and the smaller farms possibly resorting to sustainable farming.

Table 6

Farming Experience*Fertilizer Used

		Organic	Chemical	Both	Total
Experience of farming	1- 10	48	62	94	204
	greater than 20	9	28	72	109
	11- 20	7	8	33	48
Total		64	98	199	361

Table 6 describes the farm experience of the respondents against the type of fertilizers they used, whether organic, chemical, or both. The respondents were grouped into three categories according to the number of years they have engaged in farming experience, namely: 1-10 years, 11-20 years, and more than 20 years. Farmers with cumulative experience ranging from 1 to 10 years fertilize variably: 48 apply organic fertilizers, 62 use chemical fertilizers, and 94 apply both-an indication that there might be a tendency toward diversified approaches in crop health and yield maintenance.

For the over 20-year experience category, the greatest proportion in this group was 72 respondents using both organic and chemical fertilizers, then 28 using chemical fertilizers only, with the least percentage being 9, those using organic fertilizers.

This would therefore suggest that, in this trend, highly experienced farmers, having been exposed to both traditional and modern farming techniques, would combine fertilizers to maximize productivity with sustainability. The relatively low rate of usage of organic fertilizers alone among this group would be indicative of reliance on chemical input for higher crop yields. Farmers with experience in farming from 11 to 20 years had the same trend of using both fertilizers: 33 used both fertilizers; 8 relied on only chemical while 7 used only organic fertilizers. Also, the chi-square computation of ($\chi^2 = 19.482,4$, $0.001 < 0.05$) shows that significant differences occurred in fertilizer use over farming experience; therefore, farming experience is an important determinant of the types of fertilizers used. Older farmers tend to be more balanced in the use of organic and chemical fertilizers so as not to prevent soil health. The average farmers are less likely to try different methods like the increased experienced farmer. This shows that farming experience matters in types of fertilizer being used.

Table 7

Labor* Fertilizer Used

		Organic	Chemical	Both	Total
Labor	Hired	5	11	25	41
	Family Labor	59	87	174	320
Total		64	98	199	361

Table 7 describes the type of labor used for farming hired or family labor against the type of fertilizers used, classified as organic, chemical, and both. This indicates most of the respondents' farm with family labor: 59 were organic, 87 were chemical, and 174 both types. Of the bases, in contrast, a smaller percentage of the respondents employ hired workers: only 5 using organic fertilizers, 11 using chemical fertilizers, and 25 using both.

One of the major observations from the data is that for most farmers applying any type of fertilizer, whether organic, chemical, or both, the best-preferred laborer is the family. This could reflect the general farming structure in the region, where farming is normally a family-based occupation. The fact that a dependence on family labor characterizes those (174) who use a combination of fertilizers represents perhaps the balanced approach family-run traditional farms have towards fertilizer use, probably to be able to manage soil health and its sustainability along with productivity.

Chi-square test result ($\chi^2 = 1.088{,}2$, $0.580 > 0.05$), hence not significant. That means there is no difference between the type of labor and choice of fertilizers used. This implies that the source of labor, either hired or family, hardly influences a farmer's choice in fertilizer application. Farmers' attitude toward fertilizer use remains almost the same regardless of their farm labor source. This perhaps is indicative that resource availability, education, and farming experience can be more crucial factors taking the key role than the type of labor utilized in the farm.

Table 8

Soil Fertility Status*Fertilizer Used

		Organic	Chemical	Both	Total
Soil fertility status	Good	34	5	34	73
	Poor	3	18	9	30
	Medium	27	75	156	258
Total		64	98	199	361

Table 8 presents the varying condition of soil fertility status (good, poor, medium) and the correlation with type fertilizers used by the respondents. Farmers who have good soil fertility use 34, chemical fertilizers 5, while 34 use both. This could be assumed to be a balanced move whereby even farmers with the most fertile piece of land still combine the use of fertilizers in order that productivity is maintained with soil health preserved.

Farmers with poor soil fertility show a different trend, since only 3 apply organic fertilizers, 18 apply chemical fertilizers, and 9 apply both. It is thus understandable that most of these farmers would prefer the application of chemical fertilizers, since they might overburden their farming with chemical inputs in paying back the natural nutrient deficiencies of the soil. On the other hand, however, the number of farmers using both types are small; hence, farmers with poor soils either have no resources or awareness of using a balanced approach.

The highest number of respondents represents medium soil fertility; 27 use organic fertilizers, 75 use chemical fertilizers, and a further 156 use both. This therefore means that the majority of farmers with medium fertility of the soil would wish to strike a balance between promoting soil health and ensuring that the soil is productive by using both organic and chemical fertilizers.

The chi-square test shows that fertilizer use varies significantly with the state of soil fertility ($\chi^2 = 72.049$, 4, $0.000 < 0.05$). This, therefore, means that soil fertility status has contributed much to making a difference in fertilizer use. Farmers using better soil fertility depend less on organic or both fertilizers, while farmers with poor soil are more dependent on chemical fertilizers to enhance productivity. Indeed, this points out a tailored intervention which should be based on soil fertility as it pertains to promoting sustainable fertilizer practices.

Table 9

Seed Source* Fertilizer Used

		Organic	Chemical	Both	Total
Seed source	Farmer's seed	6	2	17	25
	Merchant	38	69	97	204
	Both	20	27	85	132
Total		64	98	199	361

The relationship between the respondents' fertilizer use and the seed sources farmer's seed, merchant seed, and both as shown in Table 9. Organic fertilizers are used by farmers at a rate of 6, chemical fertilizers at a rate of 2, and both at a rate of

17. Although some still use a combination of fertilizers, the comparatively low usage of chemical fertilizers by this group may indicate that farmers who grow their own seeds are more likely to use more conventional and organic agricultural practices.

On the other hand, most of those who get their seeds from merchants (204) had higher rates in using chemical fertilizers with 69 using only chemical and 97 both types of fertilizers. This group appears to be more reliant on chemical inputs, perhaps because of the influence of merchants touting the use of chemical fertilizers along with improved seed varieties for higher yields. A good number, as their response shows, preferred the complementarity between chemical and organic fertilizers, presumably in a wish to protect soil health yet be able to produce at a good level.

Those who also use their own seeds and merchants' seeds, amounting to 132 respondents. Out of this group, 85 used both types, 27 used chemical fertilizers only, and 20 were using organic fertilizers. This group reflects a more diversified approach of farmers both in seed sourcing and fertilizer use, showing a balanced strategy to optimize crop growth and sustainability.

The Chi-square test ($\chi^2 = 14.979$, 4, $0.005 < 0.05$) indicates that fertilizer usage is significantly different according to the source of seeds, and seed sourcing turns out to be an important determinant for fertilizer practice. Farmers who draw seeds from merchants are more likely to apply chemical fertilizers, whereas the ones who either use their own seeds or a mix of both tend to pursue a more balanced fertilizer approach.

Table 10

Knowledge about Soil Fertility Analysis *Fertilizer Used

		Organic	Chemical	Both	Total
Knowledge about soil fertility analysis	No	32	31	52	115
	Yes	32	67	147	246
Total		64	98	199	361

Table 10 explains how the respondent's knowledge about soil fertility analysis is related to fertilizer usage, which is categorized into organic, chemical, and both. In organic fertilizers, its usage is 32, the usage of chemical fertilizers is about 31, and both are used by 52, out of those who do not have knowledge about soil fertility analysis. The above category has balanced the use of fertilizers and is not staunchly

using a specific one. However, the overall lower number of respondents using both fertilizers may mean that those farmers who did not understand full knowledge of soil fertility analysis have partial comprehension of the complementary effect of organic and chemical fertilizers for soil health and productivity.

On the contrary, those who have knowledge in soil fertility analysis use both organic and chemical fertilizers, where 147 respondents are using both, 67 are using chemical fertilizers, while 32 are using organic fertilizers. In this group, the use of combined fertilizers is overwhelming, perhaps for the fact that knowledge of soil fertility promotes an element of balance in judgment regarding the use of fertilizers. Farmers possessing this kind of knowledge would be more worried about healthy soil while increasing yields based on joint application of organic and chemical inputs.

The chi-square result, ($\chi^2 = 12.713$, 2,0.02<0.005) reveals that there was a significant difference in fertilizer use based on knowledge of SFA; therefore, the more knowledgeable are those on fertilizer practices. Farmers who acquire the knowledge tend to adopt a more balanced approach in fertilizer application, thus using both organic and chemical fertilizers more frequently than a farmer who lacks an understanding of soil fertility and fertilizer usage. This then perhaps means that soil fertility analysis and education could enhance economically sustainable fertilizer applications and maintain long-term fertility of the soils for agricultural productivity and environmental sustainability.

Table 11

Soil Test* Fertilizer Used

		Organic	Chemical	Both	Total
Soil fertility test done or not	No	58	95	178	331
	Yes	6	3	21	30
Total		64	98	199	361

Table 11 describes the relationship between whether or not a soil fertility test has been done and the types of fertilizers used by respondents, classified as organic, chemical, or both. Of the respondents who have not conducted a soil test, 58 use organic fertilizers, 95 use chemical fertilizers and 178 use both. This group represents the most inclination to adopt the integrated fertilizer application; and most of the respondents have indeed adopted organic and chemical fertilizers to ensure crop productivity without the benefit of insight a soil test would provide.

On the other hand, of the respondents who have done a soil fertility test, organic fertilizers were used by 6, chemical fertilizers by 3, while 21 used both. The far lower number of farmers having conducted a soil test would indicate that soil testing is not a widespread practice within the community, though those conducting tests still prefer a combined approach, perhaps informed by the results of the tests for optimization in fertilizer use.

The chi-square test result of ($\chi^2 = 4.952$, 2,0.084 > 0.05) shows no evidence of significant difference in the application of fertilizer, considering whether a soil test had been conducted or not. This means that taking a soil test does not make much difference in the types of fertilizers that a farmer would use; hence, probably it is not that widely recognized or trusted as a tool to guide fertilizer decisions. Therefore, advocacy of interventions that promote soil testing should be accompanied by education on its benefits and practical applications to optimize fertilizer application for effective crop yield and soil health.

Summary /Results

This paper, therefore, generates crucial information in farmers' knowledge and practices regarding soil fertility analysis and the use of fertilizers within Godawari Municipality, Kailali, Nepal. The research considered drivers that influence changes in Practices of fertilizer application with a pool of 361 farmers, who were surveyed. The majority of farmers, though having been introduced to the concept of soil fertility, have actually never done soil fertility testing, which is relevant for determining the correctness of fertilizers applied. Of the total, 331 farmers had never carried out a soil fertility test, but 246 farmers claimed to know something about soil fertility analysis. The difference between knowledge and practice indicates that education and extension would be required to stimulate testing; only 30 farmers had acted on the knowledge.

Table 12

Cumulative Chi-Square Test

Crosstab	Variables	Hypothesis	Pearson Chi-Square Value	df	Asympotic Significant Value	Result
What fertilizer is being used	Age	H1	18.25	6	0.006	Significant Difference
What fertilizer is being used	Gender	H2	14.19	2	0.001	Significant Difference
What fertilizer is being used	Education Status	H3	4.18	6	0.652	No Significant Difference
What fertilizer is being used	Land Holding	H4	20.83	2	0.000	Significant Difference
What fertilizer is being used	Experience of Farming	H5	19.48	4	0.001	Significant Difference
What fertilizer is being used	Labor	H6	1.08	2	0.580	No Significant Difference
What fertilizer is being used	Soil-Fertility Status	H7	72.05	4	0.000	Significant Difference
What fertilizer is being used	Seed Source	H8	14.98	4	0.005	Significant Difference
What fertilizer is being used	Knowledge about fertility analysis	H9	12.71	2	0.002	Significant Difference
What fertilizer is being used	Soil Test	H10	4.95	2	0.084	No Significant Difference

Regarding the hypothesis, H1: Age influence on the types of fertilizer used was accepted because the chi-square analysis showed that there is a significant difference between fertilizer uses in the population of different age groups. Older farmers were found to be more likely to use both bioorganic and chemical fertilizers, probably because of comprehensive experience and knowledge in soil health maintenance in conjunction with increasing its productivity. Younger farmers showed more variability in fertilizer use.

H2: Gender influence on the types of fertilizer used was accepted since it emerged that male farmers were more into the use of chemical fertilizers, whereas in

females, organic fertilizers, like Gobar manure, were mostly preferred. This therefore means that gender influence could determine the type of fertilizers used.

H3: The education influence on the types of fertilizer used was not accepted because education had no significant influence on the use of fertilizers. From a statistical aspect, no difference was noted between levels of education and Practices of fertilizer use. Thus, lack of correlation may suggest that practical experiences and resource accessibility are more crucial with respect to fertilizer choice than formal education.

H4: Land holding influence on the types of fertilizers used was accepted because the chi-square test found that the area of larger landholding, the more highly the chemical fertilizers are used. On the contrary, with small landholders, use is more equilibrated between organic and chemical fertilizers. Most probably, the size of the land influences the resources and techniques available to the farmer; presumably, this may be due to the larger holding requiring more intensive chemical application.

H5: This hypothesis was accepted since, from the chi-square analysis, there was a significant difference in fertilizer use regarding farming experience. The more experienced farmer appears or tends to revert to organic fertilizers, perhaps indicating his realization on the long-term aspect of soil sustainability and traditional practices.
H6: The hypothesis concerning labor was not accepted, because in regard to the use of fertilizer, no significant difference in data was seen due to whether hired or family labor was included. This suggests that regardless of whether farmers have more or less labor support, their choice of fertilizer remains largely the same.

H7: The influence of soil fertility status on the types of fertilizer used was accepted since farmers who knew their soil fertility status, adjusted the chemical fertilizer use to that effect. This is, however, an area that needs better implementation since a very limited number of farmers conduct tests on the soil.

H8: The influence of seed source on the types of fertilizer used was accepted, since hybrid seed users are more likely to use chemical fertilizers. Farmers using traditional seeds tend towards organic fertilizers.

H9: The influence of knowledge about soil fertility analysis on types of fertilizer used was accepted because the farmers who were aware of their soil fertility status made adjustments in the use of fertilizer. From the chi-square test, the medium

and good categories of soil fertility preferred the use of fertilizer to be a mix of fertilizers, indicating an informed approach toward management for soil health.

H10: Soil test influence on types of fertilizers used was not accepted because there is no significant difference in the choice of fertilizers between farmers who have conducted a soil test and those who have not. It means that soil testing has not been one of the decisive factors in guiding fertilizer use.

Major findings are that though age, gender, land holding, farming experience, soil fertility status, seed source and knowledge about soil fertility analysis influence types of fertilizers being used, there is a significant awareness-versus-practice gap in making use of soil fertility analysis and testing. The study emphasizes that fertilizer application needs to be balanced through integrating both chemical and organic fertilizers in order to achieve sustainable agricultural development. Targeted interventions should create awareness, build infrastructure, and support farmers to conduct soil testing and apply sustainable agricultural practices in Godawari Municipality.

CHAPTER V
DISCUSSION

The study's results are examined in this chapter in light of the goals and theories of the investigation. It provides an interpretation of the statistical findings of Chapter 4 by relating them to current research and theoretical viewpoints. To explain how demographic and socioeconomic factors including age, gender, education, landholding size, and farming experience affect farmers' fertilizer use methods, each hypothesis is looked at separately. The Stimulus–Response (SR) theoretical framework is also reviewed in the debate, which shows how outside influences influence farmers' behavioral reactions. In order to explain the evolving fertilizer, use pattern in Godawari Municipality, the chapter concludes with a modified conceptual model that combines theoretical ideas and empirical facts.

The main objective of this study was to identify the determinant factors that affect the use of fertilizer use among farmers in the Godawari Municipality, Kailali. The study on the changing Practices of fertilizer use among farmers concludes several important points aligned with existing literature. Age, Gender, Land Holdings, Experience of Farming, Soil Fertility, Seed Source, Knowledge about Fertility Analysis were found to be significant determinant factors for farmers to use type of fertilizers.

Age influences the use of fertilizers, and farmers in the older age group have a tendency to balance traditional methods with the use of organic and chemical fertilizers to attain modern technique farming (Saqib et al., 2016). Farmers belonging to middle and older age groups are more likely to use both types of fertilizers for better productivity without losing the fertility of the soil. This may be interpreted to mean that experience influences their decision to combine fertilizers (Zhou et al., 2010).

The rate of adoption of fertilizers among gender differential has shown males had relatively higher proportion of adoption than females. This could be ascribed to access of male farmers to productive resources such as land holdings, and access to credit as compared to female (Kehinde et al., 2016) .The implication, therefore, is that female farmers may have their own priorities or specific constraints, perhaps against their male counterparts, in terms of access to the market and resource availability,

respectively (Quisumbing & Pandolfelli, 2010). The lower utilization of chemical fertilizers such as DAP and UREA among women, as compared to men, could point to certain structural barriers or socio-cultural influences, which call for a gender-sensitive response in agricultural interventions. The study has also pointed out gender differences in fertilizer usage, with women slightly showing a more favorable attitude toward organic fertilizers such as compost manure.

One key finding, consistent with (Aryal et al., 2021), is that landholding size significantly influences fertilizer use. Due to variations in resource availability, management techniques, and production objectives among farmers of different farm sizes, larger landholdings typically correspond with higher or more extensive fertilizer application. The size of landholding further supports (ZHU et al., 2022), who noted that large farms make more efficient use of fertilizers. This is further supported by the Godawari study, since overall, larger landholders are better poised to have access to resources and therefore better utilize chemical and organic fertilizers. Small landholders face severe constraints in terms of costing and accessibility to fertilizers, as observed even in global studies.

Farming experience is one of the critical factors contributing to the differences in fertilizer use Practices. From the data, farmers with over 20 years of experience predominantly use organic fertilizers, knowing the long-term benefits this class of fertilizers have on soil health. These findings are inconsistent with other earlier research studies on the adoption of technology, which demonstrate that farmers find it easier to adapt technology the more farming experience they have (Saqib et al., 2016).The more experienced a farmer is, the keener they are to mixing both types of fertilizers and integrating advanced technology as a way to balance productivity and sustainability (Yu & Luo, 2022).

Generally, soil fertility status normally is a determinant factor in fertilizer type usage. Farmers who know the fertility status of their soil are likely to adjust their use of fertilizers toward conserving the status. This was supported by previous studies that indicated appropriate soil fertility analysis leads to more efficient application of fertilizers, thereby assuring increased productivity with minimal environmental damage (ZHU et al., 2022).

Differences in sources of seed are also some of the factors that influence the type of fertilizer farmers' use. Farmers plant hybrid seeds, which they are most likely

to obtain from retailers, and more often go back to using chemical fertilizer in order to achieve better yields, which are derived from such types of seeds. However, farmers who plant traditional seeds tend to be disposed of toward organic fertilizers as being suitable for soil conservation in the long run (Hamid et al., 2021).

Farmers who know about soil fertility analysis are most likely to adopt the best approach in understanding the right mix of organic and chemical fertilizers. Aryal et al. (2021) , have shown that awareness and access to information act as drivers in promoting sustainable agricultural practices.

Each one of them contributes to the general practices observed in the region, regarding fertilizer use, where traditional practices are faced with modern technique approaches. These results were further supported by other studies that were previously carried out for similar agricultural contexts and were represented through such works as (Diiro et al., 2015; ZHU et al., 2022).

The results of this research are consistent with international studies but also point out some region-specific challenges, such as a lack of awareness about soil testing and government policies, which should be addressed for the dissemination of better fertilizer habits in Godawari Municipality.

The S-R Theory has a deep underlying framework for insight into how farmers in Godawari Municipality make their decisions on the use of fertilizer. This theory, proposed by Ivan Pavlov and later expanded by B.F. Skinner, hypothesizes that specific external stimuli result in predictable responses thereto (Pavlov, 1927; Skinner, 1965). In this paper, various external factors provide stimuli that force particular behavior and decision among farmers related to fertilizer application.

One major stimulus is relevant to the government policies and market conditions. Most often, government subsidies for UREA and DAP fertilizers are acting as major stimuli in forcing farmers towards chemical fertilizers in the name of productivity enhancement (Upadhyay et al., 2019). The results showed that 82% of respondents used UREA and revealed high response rates to favorable market access and government support. This response is consistent with the theoretical assertion that farmers have aligned themselves with adaptation when external conditions are presented as promising for productivity and economic gains.

Age reflects experience and knowledge. The more years the farmer has spent, the more likely he observes a longer-term change in the soil, combining organic and

chemical fertilizer applications for its sustainability and productivity. Younger farmers, therefore, tend to experiment with modern methods as much as possible (Hasibuan et al., 2022). Hence, age influences risk tolerance and openness to innovation.

Another prominent stimulus to the practices of fertilizer use is gender. Male farmers, for obvious reasons of easier market access and other resources, would be more likely to apply chemical fertilizers. On the contrary, more organic fertilizers are applied by women farmers, which may be due to socio-economic limitations (Hasibuan et al., 2022). This differentiation illustrates the way in which different forms of responsiveness to the same or similar stimulus of fertilizer availability will be conditioned by established social roles relating to gender and differential access to sources of subsistence.

Resource capability is influenced by landholding. With bigger plots, farmers could afford more chemical fertilizers and other improved inputs, while in the case of smallholders, these may adopt organic or balanced applications to maintain soil health (Wawire et al., 2021). Land size therefore prescribes the level and intensity of fertilizer use by available resources.

Farming experience is another significant stimulus that acts as a driving force: good farmers who know much about sustainability use fertilizers more cautiously and mix organic inputs with chemical ones. Less experienced farmers would tend to respond to the immediate stimulus of chemical fertilizers and thus tend to adopt them more easily in their search for short-run results without consideration for long-term sustainability (Wasil et al., 2023).

Soil fertility status is an important stimulus to deducing the practices of fertilizer use. Farmers aware of their soil's fertility status tend to adjust the fertilizer use accordingly and often incorporate organic fertilizers where appropriate (Pilbeam et al., 2005). However, most farmers in the study had not conducted soil fertility tests, therefore response to this important stimulus might have been weak. Thus, this was the gap between awareness of the soil condition and its practical application.

Seed source is also a stimulus, more so about the use of fertilizers. Those planting hybrid seeds are likely to use more chemical fertilizers to guarantee high yields whereas those still planting traditional seeds would eventually rely on organic

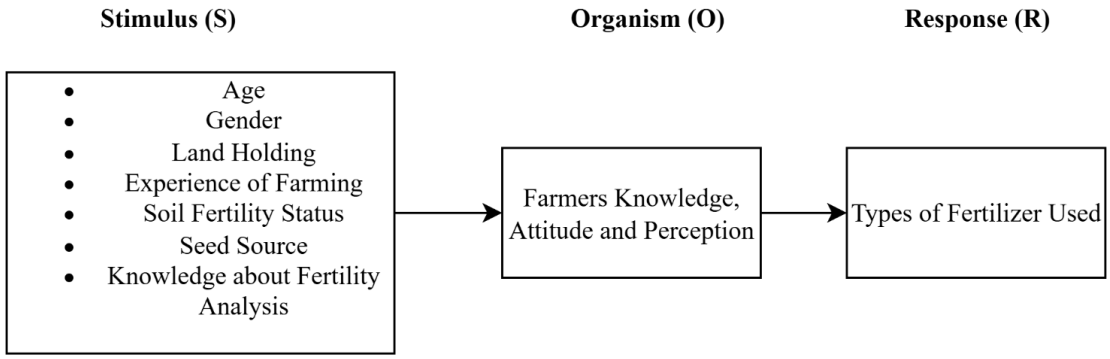
fertilizers since they bring forth different responses with the use of different seeds (Adhikari, 2014).

The most important stimuli are soil fertility analysis and testing; however, farmers' reactions to these were not strong. Though farmers were aware of soil fertility in general, the response was infinitesimally low, as reflected in lower numbers of farmers conducting soil tests (Reijneveld et al., 2019). This also hints at the better infrastructure and support required to be provided for encouraging soil testing and making more judicious decisions on fertilizer application.

These external factors include age, gender, land holding, farming experience, soil fertility status, seed source and knowledge about soil fertility analysis. All these stimuli influence farmers' response in Godawari Municipality with respect to the types of fertilizer being used. Application of S-R theory also shows how such stimulus influences various responses ranging from overuse of chemical fertilizers to the use of more balanced and sustainable practices depending on situations and forces acting upon them.

Figure 4

Final Model



According to Meijer et al. (2014) although the Stimulus- Response (SR) model originates in psychology, it is widely used across social sciences including agriculture and behavioral studies. To explain how individuals react to external conditions when making decisions. Farmer behavior, especially decision about fertilizer use is not purely technical, it is a behavioral process influenced by both external and internal factors (Meijer et al., 2014). Though being a psychological method the use of this model in the thesis is suitable because agricultural decision making is behavioral in

nature. Farmers respond to external pressures, incentives, constraints and knowledge. Using this behavioral lens allows us to understand why farmers transition from traditional organic to chemical or mixed alternatives in response to changing environment, economic and policy conditions.

The model suggests that the farmers' characteristics and socio-economic determinants (stimulus) shape their knowledge, attitude, and perception (organism), which in turn influence their fertilizer use behavior (response). The model's stimuli match precisely to major variables studied through surveys and statistical analysis, such as the strong effect of age, gender, land holding size, agricultural experience, and soil quality on fertilizer choice. The organism component stresses the mediating function of farmers' knowledge and attitudes, which the thesis recognizes as critical for implementing balanced fertilizing methods, but it also finds gaps, such as the minimal influence of soil testing on fertilizer decisions despite some awareness. Also, the "response" section clearly reveals the study's major finding, which is what sort of fertilizer the farmers use.

CHAPTER VI
CONCLUSION AND IMPLICATIONS

Conclusion

This study conducted to explore the Factors Affecting the Changing Practices of Fertilizer Use, its main objective is to identify and analyze the respective factors affecting different changing practices of fertilizer use among farmers of Godawari Municipality, Far-Western Nepal. The positive and significant relationships obtained between demographic factors and types of fertilizer used and factors indicate a complex interplay that exists between various socio-economic and demographic factors and fertilizer use amongst local farmers. These variables include age, gender, size of landholding, and farming experience etc. These variables are very influential on the farmers' decisions to either adopt chemical or organic fertilizers. The application of the S-R theory has been important in framing these variables into specific stimuli that trigger relevant behavioral responses in fertilizer use, thus making the farmers' decision-making process quite rewarding.

The findings show that fertilizer choice is not uniform but shaped by age, gender, landholding, farming experience, soil fertility, seed source, and knowledge of soil analysis. Younger farmers are more inclined to use chemical inputs to increase yields, but older and more seasoned farmers typically combine chemical and organic fertilizers. While female farmers exhibit a larger preference for organic inputs, male farmers rely more on chemical fertilizers. While smallholders choose an organic or balanced approach, larger landholders use more chemical fertilizers. Although actual soil testing is still infrequent and has little influence on current practices, farmers who understand soil fertility are more inclined to use both types of fertilizers.

The variations across these factors highlight the diverse motivations and constraints influencing fertilizer practice of farmers in the Municipality. These practices reflect the farmer’s lived realities including perception of soil fertility, access to inputs and familiarity with chemical and organic options. Overall, the study demonstrates that the fertilizer practices in Godawari Municipality is dynamic and influenced by multiple interacting factors rather than a single determinant. The insights from this research help clarify the underlying reasons for the shift in fertilizer practices. It also provides a clear understanding of how different farmer groups

respond to changing agricultural conditions. This contributes to the broader understanding of behavioral and contextual elements shaping fertilizer use in the region.

Implications

The implication shows that the farmers in Godawari Municipality requires necessitate attention to encourage more sustainable and efficient use of fertilizers. The outputs highlight the need for focused interventions. To engage continual engagement of younger and bigger landholding farmers to establish a balance between soil health and productivity, extension education aligned program should be conducted with given ambient emphasis on integrated fertilizer management. Gender-sensitive support is critical, particularly in increasing the availability of organic fertilizers, markets, and training for female farmers. By expanding the availability of soil testing services and emphasizing their benefits, the gap between knowledge and practice can be bridged. These implications directly arise from the study's key findings on how demographic and socio economic factors drive the changing fertilizer practices in Godawari. Since farmers are gradually shifting from purely organic methods to chemical and mixed fertilizer use. Trailored interventions such as youth focused integrated nutrient management training, gender sensitive extension support ,and improved access to soil testing services are essential. Moreover, policies should be based on the Nepal's Agriculture Development Strategy 2015-2035, which targets reducing the high levels of chemical fertilizer reliance in the country and enhance the local manufacture and distribution of organic fertilizers. Focusing on these issues would boost agricultural production and maintain soil fertility and ecological safety.

Introspection

The experience of working on this thesis, "Factors Affecting the Changing Practices of Fertilizer Use: A Survey among Farmers of Godawari Municipality, Far-Western Nepal," has truly changed my life. Although the original goal of this research was undoubtedly to determine the socioeconomic elements impacting farmers' fertilizer use, it also gave me the opportunity to examine in detail the realities of farmers' shifting agricultural practices in rural Nepal. Difficulties arose during the process of developing research approaches and collecting data, and this continuous alteration forced me to constantly learn and adjust. Making the questionnaire more farmer-friendly while still collecting useful data was a really fulfilling task.

One of the most difficult tasks I faced was time management. Careful planning was required for data collection in a remote area; unanticipated delays, such as farmer availability, hampered the process. Furthermore, data processing grew acquainted with SPSS and its learning curve, but it also became a very useful ability for better evaluating and presenting findings. This research has made me realize the significance of adaptation and tenacity for an academic person to grow, both personally and professionally.

In addition to my knowledge gained in the classroom, this thesis research has really assisted in boosting my personal development. It has significantly increased my capacity to conduct qualitative and quantitative data, boosting my confidence to enhance my research capacity and enhance my ability to tackle day-to-day difficulties in the field. These skills and viewpoints, in my opinion, will be quite helpful as I continue to strive for sustainable agriculture and development. The completion of this project has really boosted my confidence, strengthened my perseverance and growth and has been a turning point of my academic path.

REFERENCES

Adefila, A. O., Ajayi, O. O., Toromade, A. S., & Sam-Bulya, N. J. (2024). Integrating traditional knowledge with modern agricultural practices: A sociocultural framework for sustainable development. *World Journal of Biology Pharmacy and Health Sciences*, *20*(02), 125–135.

Adhikari, J. (2014). *Seed sovereignty : Analysing the debate on hybrid seeds and GMOs and bringing about sustainability in agricultural development*.Nepal Journals Online ,*12*(1), 33–46.

Anastasi, A., & Urbina, S. (1997). Validity: basic concepts. *Psychological Testing*, *7*, 113–139.

Arun, G. C., & Ghimire, K. (2017). Determinants of pesticide application in nepalese vegetable farming: An empirical analysis using multivariate probit model. *Preprints*.

Aryal, J. P., Sapkota, T. B., Krupnik, T. J., Rahut, D. B., Jat, M. L., & Stirling, C. M. (2021). Factors affecting farmers' use of organic and inorganic fertilizers in South Asia. *Environmental Science and Pollution Research*, *28*(37), 51480–51496. https://doi.org/10.1007/s11356-021-13975-7

Baral, B. R., Pande, K. R., Gaihre, Y. K., Baral, K. R., Sah, S. K., Thapa, Y. B., & Singh, U. (2020). Increasing nitrogen use efficiency in rice through fertilizer application method under rainfed drought conditions in Nepal. *Nutrient Cycling in Agroecosystems*, *118*(1), 103–114.

Baral, P., Paudel, R., Kharal, S., & Khadka, A. (2020). Organic agriculture in Nepal: policies and practices. *Journal of the Institute of Agriculture and Animal Science*, 279–289.

Barten, J. A., Pisters, M. F., Huisman, P. A., Takken, T., & Veenhof, C. (2012). Measurement properties of patient-specific instruments measuring physical function. *Journal of Clinical Epidemiology*, *65*(6), 590–601. https://doi.org/https://doi.org/10.1016/j.jclinepi.2011.12.005

Brink, H. (1993). Validity and reliability in qualitative research. *Curationis*, *16*, 35–38. https://doi.org/10.4102/curationis.v16i2.1396

Britz, E., Cyster, L., Samuels, I., Cupido, C., Masemola, L., Ngcobo, N., Manganyi, F., & Müller, F. (2023). Nitrogen fertilization increases the growth and

nutritional quality of the forage legume, Calobota sericea–A preliminary investigation. *Heliyon*, *9*(2).

Burtan, L., Lacatusu, A. R., Sîrbu, C., Cioroianu, T., Lazar, R., Lungu, M., & Lacastu, R. (2018). Use organic fertilizers in the modern agriculture. *Annals of the University of Craiova-Agriculture, Montanology, Cadastre Series*, *47*(1), 272–283.

Dhakal, S., Chaulagain, B., Bhattarai, R., Pandit, A., Dangi, B., & Dahal, R. (2024). *Organic approaches for preserving soil health in the mountainous agro-ecosystem of nepal: A review*. *3*, 329–343. https://doi.org/10.17311/tas.2024.329.343

Diiro, G. M., Ker, A. P., & Sam, A. G. (2018). The role of gender on fertilizer adoption in uganda." The role of gender in fertiliser adoption in uganda. *African Journal of Agricultural and Resource Economics*, *10*(September), 117–130.

Diiro, G. M., Ker, A. P., & San, A. G. (2015). The role of gender in fertiliser adoption in Uganda. *African Journal of Agricultural and Resource Economics*, *10*(2), 117–130.

Dong, H., Wang, B., Han, J., Luo, L., Wang, H., Sun, Z., Zhang, L., Dai, M., Cheng, X., & Zhao, Y. (2022). Understanding farmers' eco-friendly fertilization technology adoption behavior using an integrated S-O-R model: The case of soil testing and formulated fertilization technology in shaanxi, china. *Frontiers in Environmental Science*, *10*(September), 1–14. https://doi.org/10.3389/fenvs.2022.991255

Food and Agricultur Organizations (FAO). (2017). The future of food and agriculture-Trends and challenges. Rome. In *The future of food and agriculture: trends and challenges* (Vol. 4, Issue 4). https://openknowledge.fao.org/server/api/core/bitstreams/2e90c833-8e84-46f2-a675-ea2d7afa4e24/content

Food and Agricultur Organizations (FAO). (2018).*Sustainable agriculture for biodiversity ,biodiversity for sustainable.*

Feliciano, D. (2022). Factors influencing the adoption of sustainable agricultural practices: the case of seven horticultural farms in the United Kingdom. *Scottish Geographical Journal*, *138*(3–4), 291–320.

https://doi.org/10.1080/14702541.2022.2151041

Gamage, A., Gangahagedara, R., Gamage, J., Jayasinghe, N., Kodikara, N., Suraweera, P., & Merah, O. (2023). Role of organic farming for achieving sustainability inagriculture. *FarmingSystem, 1*(1),100005. https://doi.org/10.1016/j.farsys.2023.100005

Ghimire, S., & Dhakal, A. (2021). Effects of Agricultural Inputs use on agricultural productivity in Nepal: an empirical study. *International Journal of Agricultural Economics, 6*(5), 212. https://doi.org/10.11648/j.ijae.20210605.12

Hamid, F., Yazdanpanah, M., Baradaran, M., Khalilimoghadam, B., & Azadi, H. (2021). Factors affecting farmers' behavior in using nitrogen fertilizers: society vs. farmers' valuation in southwest Iran. *Journal of Environmental Planning and Management, 64*(10), 1886–1908. https://doi.org/10.1080/09640568.2020.1851175

Hasibuan, A., Ferry, Y., & Wulandari, S. (2022). Factors affecting farmers' decision to use organic fertilizers on Robusta coffee plantation: A case study in Tanggamus, Lampung. *IOP conference series: Earth and environmental science, 974*, 12105. https://doi.org/10.1088/1755-1315/974/1/012105

Himal Press. (2025). *Major highlights of govt's policies and programs for FY 2025/26*. https://en.himalpress.com/major-highlights-of-govts-policies-and-programs-for-fy-2025-26/

Huang, W., & Wang, X. (2024). The Impact of Technological Innovations on Agricultural Productivity and Environmental Sustainability in China. *Sustainability, 16*(19). https://doi.org/10.3390/su16198480

Israel, M., & Hay, I. (2006). Research ethics for social scientists. Sage.

Jha, S., Singh, B., Poudel, D., Shingh, S., Tiwari, P., & Shrestha, P. (2021). Analyzing the growth and performance of agriculture sector in Nepal. *Asian Journal of Advances in Agricultural Research, 16*(3), 22–40.

John, D. A., & Babu, G. R. (2021). Lessons from the aftermaths of green revolution on food system and health. *Frontiers in Sustainable Food Systems, 5*, 644559.

Johnson, E. N., Malhi, S. S., Hall, L. M., & Phelps, S. (2013). Effects of nitrogen fertilizer application on seed yield, N uptake, N use efficiency, and seed quality of Brassica carinata. *Canadian Journal of Plant Science, 93*(6), 1073–

1081. https://doi.org/10.4141/CJPS2013-222

Jones, C. (2023). Fertilizers: Its importance in modern agriculture, crop yields and ensuring food security. *Journal of Agricultural Science and Food Research*, *14*(3), 1–2. https://doi.org/10.35248/2593-9173.23.14.155

Kansanga, M., Andersen, P., Atuoye, K., & Mason-Renton, S. (2018). Contested commons: Agricultural modernization, tenure ambiguities and intra-familial land grabbing in Ghana. *Land Use Policy*, *75*, 215–224.

Kehinde, A. L., Opeyemi, A. A., Fidelis, O. A., Ademola, B., & Philip, O. (2016). Gender differentials and fertilizer adoption among small holder. International Journal of Agricultural Policy and Research, 4(12), 276-281.

Lama, M. (2024).*Secrtor wise credit concentration of Nepalese commercial banks and it's impact on profitability*. Shanker Dev Campus.

Landis, J. R., & Koch, G. G. (1977). The measurement of observer agreement for categorical data. *Biometrics*, *33*(1), 159-174.

Li-hua, X. I. E., Ling-ling, L. I., Jun-hong, X. I. E., Jin-bin, W., Yong-jie, Z., Qian, C., & Fudjoe, S. (2022). Effects of substitution of chemical fertilizer by organic fertilizer on maize growth and field carbon emission in dry farming area of Longzhong, Gansu Province. *Journal of Plant Nutrition and Fertilizers*, *28*(6), 1029–1038.

Lin, Y., Hu, R., Zhang, C., & Chen, K. (2022). The role of public agricultural extension services in driving fertilizer use in rice production in China. *Ecological Economics*, *200*, 107513.

Materechera, S. A. (2010). Utilization and management practices of animal manure for replenishing soil fertility among smallscale crop farmers in semi-arid farming districts of the North West Province, South Africa. *Nutrient Cycling in Agroecosystems*, *87*(3), 415–428. https://doi.org/10.1007/s10705-010-9347-7

McArthur, T. (2017). *The efficiency implications of firm heterogeneity in Latin American agriculture*. University of Wisconsin--Madison.

Meijer, S. S., Catacutan, D., Ajayi, O. C., Sileshi, G. W., & Nieuwenhuis, M. (2014). The role of knowledge, attitudes and perceptions in the uptake of agricultural and agroforestry innovations among smallholder farmers in sub-Saharan Africa. *International Journal of Agricultural Sustainability*, *13*(1), 40–54.

https://doi.org/10.1080/14735903.2014.912493

Miah, M. A., Sarkar, M., Shofiqul Islam, M., Alam, M., Harun-Ar-Rashid, M., Boyd, D., Bell, R., Haque, M. E., Satter, M., Rahman, M. W., Jahan, H., & Hutchison, J. (2019). *Assessment of gaps in current fertilizer use by farmers and scientific recommendations in selected areas of Bangladesh: A Baseline Study*.

Micha, E., Tsakiridis, A., Ragkos, A., & Buckley, C. (2023). Assessing the effect of soil testing on chemical fertilizer use intensity: An empirical analysis of phosphorus fertilizer demand by Irish dairy farmers. *Journal of Rural Studies*, *97*(November 2022), 186–191. https://doi.org/10.1016/j.jrurstud.2022.12.018

Ministry of Agriculture and Livestock Development (MOAD). (2015). *Agriculture development strategy (ADS) 2015 to 2035*. Ministry of Agricultural Development, Part 1, 20. http://www.nnfsp.gov.np/PortalContent.aspx?Doctype=Resources&ID=61

Moreda, T. (2023). The social dynamics of access to land, livelihoods and the rural youth in an era of rapid rural change: Evidence from Ethiopia. *Land Use Policy*, *128*(June 2021), 106616. https://doi.org/10.1016/j.landusepol.2023.106616

Muhie, S. H. (2022). Novel approaches and practices to sustainable agriculture. *Journal of Agriculture and Food Research*, *10*(August), 100446. https://doi.org/10.1016/j.jafr.2022.100446

Nepal News. (2025). *A Comprehensive Look at Nepal Government's 2025-26 Policies and Programs*. https://nepalnews.com/s/explainers/a-comprehensive-look-at-nepal-governments-2025-26-policies-and-programs/

Nepal Rastra Bank (NRB). (2021). *Nepal Rastra Bank Current Macroeconomic and Financial Situation of Nepal*. 1–11.

Nsengimana, V., de Dieu Nsenganeza, J., Hagenimana, T., & Dekoninck, W. (2023). Impact of chemical fertilizers on diversity and abundance of soil-litter arthropod communities in coffee and banana plantations in southern Rwanda. *Current Research in Environmental Sustainability*, *5*, 100215.

Pahalvi, H. N., Rafiya, L., Rashid, S., Nisar, B., & Kamili, A. N. (2021). Chemical fertilizers and their impact on soil health. In *Microbiota and biofertilizers, Vol 2: Ecofriendly tools for reclamation of degraded soil environs* (pp. 1–20).

Springer.

Pandey, S. P. (2014). *The role of fertilizer in transforming the agricultural economy of Nepal*.

Pani, S. K., Jena, D., Subudhi, R., & Rath, J. P. (2021). Nitrogen fertilizer use in agriculture among marginal and small farmers in India: review of important drivers. *International Journal of Modern Agriculture*, *10*(2), 1746–1756. https://www.modern-journals.com/index.php/ijma/article/view/911

Pavlov, P. I. (1927). Conditioned reflexes: An investigation of the physiological activity of the cerebral cortex. *Annals of Neurosciences*, *17*(3), 136.

Pilbeam, C., Mathema, S. B., Gregory, P., & Shakya, P. (2005). Soil fertility management in the mid-hills of Nepal: Practices and perceptions. *Agriculture and Human Values*, *22*. https://doi.org/10.1007/s10460-004-8284-y

Pokhrel, D. M., & Pant, K. P. (2009). Perspectives of organic agriculture and policy concerns in Nepal. *Journal of Agriculture and Environment*, *10*, 103–115.

Pretty, J. (2013). *Agri-culture: reconnecting people, land and nature*. Routledge.

Quisumbing, A. R., & Pandolfelli, L. (2010). Promising Approaches to Address the Needs of Poor Female Farmers: Resources, Constraints, and Interventions. *World Development*, *38*(4), 581–592. https://doi.org/10.1016/j.worlddev.2009.10.006

Reijneveld, A., Bohemen, F., Termorshuizen, A., & Oenema, O. (2019). Farmer's Perceptions of Soil Tests: A Case Study in the Netherlands. *Acta Scientific Agriculture*, *3*, 96–103. https://doi.org/10.31080/ASAG.2019.03.0570

Resnik, D. B. (2018). *The ethics of research with human subjects: Protecting people, advancing science, promoting trust* (Vol. 74). Springer.

Sánchez Bogado, A. C., Estrada-Carmona, N., Beillouin, D., Chéron-Bessou, C., Rapidel, B., & Jones, S. K. (2024). Farming for the future: Understanding factors enabling the adoption of diversified farming systems. *Global Food Security*, *43*(November). https://doi.org/10.1016/j.gfs.2024.100820

Sapkota, M., & Bajracharya, M. (2018). Resource use efficiency analysis for potato production in Nepal. *Journal of Nepal Agricultural Research Council*, *4*, 54–59.

Saqib, S. e., Ahmad, M. M., Panezai, S., & Ali, U. (2016). Factors influencing farmers' adoption of agricultural credit as a risk management strategy: The

case of Pakistan. *International Journal of Disaster Risk Reduction*, *17*, 67–76. https://doi.org/10.1016/j.ijdrr.2016.03.008

Shrestha, J., Karki, T. B., & Hossain, M. A. (2022). Application of nitrogenous fertilizer in rice production: A review. *Journal of Nepal Agricultural Research Council*, *8*, 16–26.

Skinner, B. F. (1965). *Science and human behavior* (Issue 92904). Simon and Schuster.

Sumathipala, A., & Siribaddana, S. (2003). *Research ethics from a developing world perspective*. Vijitha Yapa Publications Colombo,, Sri Lanka.

Takeshima, H., Adhikari, R. P., Kaphle, B. D., Shivakoti, S., & Kumar, A. (2016). Determinants of chemical fertilizer use in Nepal. In *IFPRI discussion paper 1507* (p. 48). International Food Policy Research Institute (IFPRI) Washington, DC.

Thapa, G., Gaihre, Y. K., Choudhary, D., & Gautam, S. (2023). Does private sector involvement improve the distribution efficiency of subsidized fertilizer? A natural experiment from Nepal. *Agricultural Economics*, *54*(3), 429–446.

Upadhyay, N., Bhandari, N., Gairhe, S., Kafle, N., & Sapkota, M. (2019). Fertilizer subsidy policy and its economic implications in Nepal. *Journal of Agriculture and Environment*, *20*, 100–116.

Vista, S. P., Devkota, S., Shrestha, S., Kandel, S., Rawal, N., Amgain, R., Joshi, S., Paneru, P., Rayamajhi, K., & Timilsina, S. (2022). Fertilizers in Nepal. National Agriculture Research Institute, National Soil Science Research CentreKhumaltar, Lalitpur, Nepal.

Wasil, A., Shah, J., Kakar, S., Ragashtai, A., Yusuf, M., & Sadat, A. (2023). The influential factors of organic fertilizer adoption among farmers: A review. *International Journal of Academic Research in Business and Social Sciences*, *13*, 3020–3036. https://doi.org/10.6007/IJARBSS/v13-i5/16885

Wawire, A., Csorba, A., Tóth, J., Micheli, E., Szalai, M., Mutuma, E., & Tormáné Kovács, E. (2021). Soil fertility management among smallholder farmers in Mount Kenya East region. *Heliyon*, *7*, e06488. https://doi.org/10.1016/j.heliyon.2021.e06488

Whiston, T. G. (2012). *Managerial and organisational integration*. Springer Science & Business Media.

Whittemore, R., Chase, S., & Mandle, C. (2001). Validity in qualitative research. *Qualitative Health Research*, *11*, 522–537. https://doi.org/10.1177/104973201129119299

Wokibula, R. A., Dentzman, K., Akitwine, F., Mtama, J. G., Mbeiza, M., & Burras, C. L. (2025). Factors that affect the adoption of fertilizer among cocoa farmers in developing countries: A review. *Global Challenges*, *9*(1), 2400175.

Yara. (2024). *The importance of fertilizer in modern agriculture*. Yara. https://www.yara.com/crop-nutrition/crop-and-agronomy-knowledge/why-is-fertilizer-important.

Yu, W., & Luo, X. (2022). Farming experience and farmers' adoption of low-carbon management practices: The case of soil testing and fertilizer recommendations in China. *Environmental Science and Pollution Research*, *29*(5), 6755–6765.

Zhan, Y., Zhan, X., & Wu, M. (2025). Institutional change and agricultural modernization: The impact of land certification on agricultural technology Adoption. In *Land* (Vol. 14, Issue 7). https://doi.org/10.3390/land14071420

Zhang, Z. S., Chen, J., Liu, T. Q., Cao, C. G., & Li, C. F. (2016). Effects of nitrogen fertilizer sources and tillage practices on greenhouse gas emissions in paddy fields of central China. *Atmospheric Environment*, *144*, 274–281.

Zhou, Y., Yang, H., Mosler, H.-J., & Abbaspour, K. C. (2010). Factors affecting farmers' decisions on fertilizer use: A case study for the Chaobai watershed in Northern China. *Consilience: The Journal of Sustainable Development*, *3*(1), 80–102.

ZHU, W., QI, L. xia, & WANG, R. mei. (2022). The relationship between farm size and fertilizer use efficiency: Evidence from China. *Journal of Integrative Agriculture*, *21*(1), 273–281. https://doi.org/10.1016/S2095-3119(21)63724-3

ANNEX

Annex- 1: Survey Form for Godawari Municipality, Attariya Kailali, Nepal

1. Name of the interviewer: _____, Time: _____ **2.** Date of interview: _____

3. Name of the landowner: _____

4. Age: _____

5. Gender

i) Male ( ) ii) Female ( ) iii) Others ( )

6. Education

i) Master's ( ) ii) Bachelor ( ) iii) Higher Secondary ( ) iv) S.L.C ( ) v) Primary Level ( )

7. Land holding (Kattha)

( ) Kattha

8. Experience of farming

( ) yrs.

9. Labor

i) Hired ( ) ii) Family labor ( )

10. Soil fertility status

i) Good ( ) ii) Poor ( ) iii) Medium ( )

11. Name of Variety used

i) Rainy Season crops

_____.

ii) Dry Season crops

_____.

12. Seed source

i) Farmers' seed ( ) ii) Merchant ( ) iii) Both ( )

13. Method of land preparation

i) Animal ( ) ii) Machine ( ) iii) Both ( )

14. No. of year for fertilizer application

_____.

15. Fertilizer application

i) Organic ( ) ii) Chemical ( ) iii) Both ( )

If organic,

Name _____.

If Chemical

i) UREA ( ) ii) DAP ( ) iii) Potash (K) ( ) iv) ZINC ( )

16**. Weed management**

i) Hand weeding ( ) ii) Hoe (Kuto/Kodalo) weeding ( ) iii) Both ( )

17**. Method of harvest**

i) Manual ( ) ii) Machine ( ) iii) Both ( )

18. Practices of incorporating crop residue?

i) Ploughing ( ) ii) Disking ( ) iii) Harrowing ( ) iv) Tilling ( )

19. Do you know about soil fertility analysis?

i) Yes ( )

ii) No ( )

20. Have you done soil test?

i) Yes ( )

ii) No ( )

If yes, where, when ----------

---------- If no, why? ----------

----------.

Translated Questionnaire

अनुसूची- २

Annex-2: सर्वेक्षण फारम, गोदावरी नगरपालिका, अत्तरिया कैलाली, नेपाल

[मे, २०२४]

१. अन्तर्वार्ता लिने व्यक्तिको नाम: _____, समय: _____

२. अन्तर्वार्ताको मिति: _____

३. जग्गा धनीको नाम: _____

४. उमेर: _____

५. लिङ्ग

i) पुरुष ( ) ii) महिला ( ) iii) अन्य ( )

६. शिक्षा

i) मास्टर ( ) ii) ब्याचलर ( ) iii) उच्च माध्यमिक ( ) iv) एस.एल.सी ( ) v) प्राथमिक तह ( )

७. जग्गा धारण (कठ्ठा)

( ) कठ्ठा

८. कृषिको अनुभव

( ) वर्ष

९. श्रम

i) भाडामा लिइएको ( ) ii) पारिवारिक श्रम ( )

१०. माटोको उर्वराशक्ति अवस्था

i) राम्रो ( ) ii) कमजोर ( ) iii) मध्यम ( )

११. प्रयोग गरिएको बालीको जात

i) बर्खे बाली _____.

ii) हिउँदे बाली _____.

१२. बीउको स्रोत

i) किसानको बीउ ( ) ii) व्यापारी ( ) iii) दुवै ( )

१३. जग्गा तयारीको विधि

i) जनावर ( ) ii) मेसिन ( ) iii) दुवै ( )

१४ .मल प्रयोग गरेको वर्षको संख्या _____.

१५ .मलको प्रयोग

i) जैविक ( ) ii) रासायनिक ( ) iii) दुवै( )

यदि जैविक भए,

नाम _____.

यदि रासायनिक भए

i) युरिया ( ) ii) डिएपी ( ) iii) पोटास) K) ( ) iv) जिंक( )

१६ .झार व्यवस्थापन

i) हाते झारपात () ii) कुदल (कुटो/कोडालो) झारपात () iii) दुबै ()

१७ .कटनीको विधि

i) हातले ( ) ii) मेसिन ( ) iii) दुवै( )

१८ .बालीको अवशेष समावेश गर्ने अभ्यास?

i) हलो जोत्ने ( ) ii) डिस्किङ ( ) iii) ह्यारो गर्ने ( ) iv) जोत्ने( )

१९ .के तपाईलाई माटो उर्वराशक्ति विश्लेषणबारे जानकारी छ?

i) छ))

ii) छैन( )

२० .के तपाईले माटो परीक्षण गर्नुभएको छ?

i) छ))

ii) छैन))

यदि छ भने, कहाँ, कहिले

_____

यदि छैन भने, किन?

_____

Annex 3: Reliability Test

First Phase: Soil Fertility Test	Second Phase: Soil Fertility Retest
1,Good,	Good
2,Good,	Good
3,Good,	Medium
4,Good,	Good
5,Good,	Good
6,Good,	Medium
7,Good,	Good
8,Good,	Good
9,Good,	Medium
10,Good,	Good
11,Medium,	Medium
12,Medium,	Medium
13,Medium,	Medium
14,Medium,	Medium
15,Medium,	Medium
16,Medium,	Good
17,Medium,	Medium
18,Medium,	Medium
19,Medium,	Poor
20,Medium,	Medium
21,Poor,	Poor
22,Poor,	Poor
23,Poor,	Medium
24,Poor,	Poor
25,Poor,	Poor
26,Poor,	Medium
27,Poor,	Poor
28,Poor,	Poor
29,Poor,	Medium
30,Poor,	Poor

31,Good, Good

32,Good, Medium

33,Good, Good

34,Medium, Medium

35,Medium, Good

36,Medium, Medium

37,Poor, Poor

38,Poor, Poor

39,Poor, Medium

40,Medium, Medium

Test \ Retest	Good	Medium	Poor	Row Total
Good	9	3	0	12
Medium	2	8	1	11
Poor	0	3	14	17
Column Total	**11**	**14**	**15**	**40**

Step 2.1 — Observed Agreement PoP_oPo

Agreements = (9 + 8 + 14) = 31

Po=31/40=0.775

P_e=0.338

K=0.66