SCHOOL OF GRADUATE STUDIES
COLLEGE OF DEVELOPMENTAL STUDIES
CENTER FOR ENVIRONMENT AND DEVELOPMENT STUDIES

THE ROLE OF LOCALLY IMPROVED ORGANIC AGRICULTURAL INPUTS UTILIZATION FOR SUSTAINABLE CROP PRODUCTION: EVIDENCE FROM ASSOSA ZURIYA WOREDA BENISHANGUL GUMUZE REGION, WESTERN ETHIOPIA

By

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The role of locally improved organic agricultural inputs utilization for sustainable crop production: evidence from Assosa zuriya woreda, Benishangul Gumz region, western Ethiopia.

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DECLARATION

This thesis entitled "The role of locally improved organic agricultural inputs utilization for sustainable crop production: evidence from Assosa Zuriya woreda, Benishangul Gumze Region, Western Ethiopia" is my original work and has not been presented for MA degree in any other University and that all the sources and materials used for the thesis have been properly acknowledged.

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This is to certify that the above declaration made by the candidate is correct to the best of my knowledge as an advisor.

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LIST OF ABBREVIATIONS

ADLI……Agricultural Development Led Industrialization
ATA…… Agricultural Transformation Agency
0C……Degree Celsius
Cu……...Copper
DA……...Development Agent
FAO……..Food and Agriculture Organization
FGD…….Focus Group Discussion
GDP……Growth Domestic Production
Ha……....Hectare
HHS……Households
IFOAM……...International Federation of Organic Agriculture Movements
K…….Potassium
KII……. Key Informant Interview
LIOAI……...Locally Improved Organic Agricultural Input
Max……...Maximum
Mg…….....Magnesium
Min…….....Minimum
MM…….....Millimeter
MOA…….....Ministry of Agriculture
N…….....Nitrogen
NGO…….....Non-Governmental Organization
OA…….. Organic Agriculture
P…….. Phosphorus
S…….. Sulphur
SPSS……..... Statistical Package for Social Sciences
SD……... Standard deviation
Zn……... Zinc

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Abstract

Organic inputs are importantly needed for organic and sustainable agriculture, especially biological fertilizers, biological nutrients, biological insecticides, biological fungicides and biological herbicides together with other cultural practices and conventional methods. Despite this fact there are limited studies carried out in Ethiopia on their contribution for sustainable crop production. Therefore, this study was focused on the role of locally improved organic agricultural input for sustainable crop production in one woreda of Benishangul Gumuze western Ethiopia. Household survey, focus group discussions and key informant interview was used as a data collection method. These were followed by descriptive statistical analysis of quantitative data with SPSS and thematic analysis of qualitative data. The in the study area 68.8% from the surveyed community started utilizing of organic agricultural input. Age of household, educational level and household family size has a positive implication to introduce utilization of locally improved agricultural input. The surveyed community interested in using the input due to its economic benefit. This encouraged the implementation of utilizing organic input.

Based on the findings it is concluded that getting more attention from ministry of agriculture, linking with the agricultural extension system for the country, better collaboration of governmental and non-governmental organization, organizing capacity building programs, practical oriented trainings are needed to scale out this practice and enhance technology uptake. Consequently, this can help the community to increase tier production sustainably, thereby minimizing production cost.

Understanding the role of organic input utilization provides baseline information for input intensification policies and strategies. Therefore, this review pointed out that it is very important to practice and adopt utilizing of organic input utilization by smallholder farmers sustainable crop production.

Keywords: Organic input, locally improved organic inputs, sustainable crop production

CHAPTER ONE

INTRODUCTION

1.1. Background of the Study

Agriculture began in Ethiopia ten thousand years ago, during the Neolithic Revolution. Domestication of crops and animals was the first step. Despite increasing ecological and population pressure, farmers have continued to use their time-tested production strategies. Since the Neolithic era, Ethiopian agriculture has relied mainly on oxen plow and rain-fed agriculture, with little usage of other alternative technologies (Diriba, 2020).

“Sustainable agriculture” simply refers to farming practices that incorporate and prioritize sustainability, or the ability to maintain a process over time. It describes an agricultural system that can be sustained indefinitely, providing food and fiber to meet the needs of the present and the needs of future generations. Sustainable agriculture attempts to address current requirements without jeopardizing the resource base for future generations. The important concern in Ethiopian agriculture is maintaining improved production to meet the rising demand for food due to the country's growing population. Most traditional farming practices are unsustainable in terms of natural resources and soil fertility, and they exacerbate erosion (Deressa, 2007). Sustainable agricultural practices for increasing soil fertility, top soil's ability to retain organic matter, nutrients, and water, diversity of crops, microbes, and other plants and animals in and around the field, increasing carbon sequestration, reducing the use of hazardous chemicals such as pesticides, minimizing soil erosion and landslides, and improving green cover to conserve soil As a result, maintaining soil health/quality is essential for crop productivity to be sustained (Grepperud, 1996; Kassie et al., 2008).

Sustainable agriculture, which can lead to formally recognized organic farming, is widely defined as an agricultural system that combines sustainable production techniques with the elimination or reduction of potentially damaging to the environment production practices (D'Souza et al., 1993). Sustainable agriculture, according to the Food and Agriculture Organization of the United Nations (FAO), has five primary characteristics: it conserves resources, is environmentally non-degrading, is technically adequate, and is commercially and

socially acceptable (FAO, 2008). Sustainable agriculture, in reality, requires fewer external off-farm inputs, such as chemical fertilizers, and makes better use of locally accessible natural resources, as well as purchased inputs (Lee, 2005).

The current poor farming techniques, combined with the increased use of synthetic fertilizer, frequent farming and pesticide in increasing levels, may have contributed to the formation of soil acidity, resulting in a loss of production and productivity, The main reason for frequent farming system on farmland is lack of awareness on improved agricultural practices (Kassie et al., 2008). Due to improper application and management, agricultural goods produced on such farms include harmful chemical residues that harm both consumers and farmers (Grepperud, 1996).

Many studies have revealed that organic agriculture is productive and sustainable because it helps to increase soil organic matter by providing solutions to problems related to soil fertility, pest and disease, and also raises resilience against drought and the impact of climate change (Smuker et al., 2010).

Organic agriculture includes all agricultural systems that promote environmental, socially and economic production. These systems rely on soil fertility as a key to successful production and are defined as a holistic product management system to promote and enhance agro-system and biodiversity, biological cycles, and soil biological activity (James et al., 2000). In connection to this, Cheryl, and Matt (2012) argued that the interesting in organic foods, along with farmer's interest helped more in implementing of organic agriculture. It has been learned about the risk associated with conventional agriculture (James et al., 2000).

Organic agriculture is concerned about natural and maintaining natural balance to build up agro ecosystem, which aims to reduce the use of chemical fertilizer and pesticide Organic products are safe for consumers and have more demand in the market. There are many techniques that have been used for organic crop production (Brandt et al., 2015).

The organic agriculture has begun with work of Englishman Sir Albiert Haward, who developed "organic growing method" in India in the early 1900s. Rudolf Steiner and Ehrinfried Pfieffert were developed "biodynamic" methods based on concept that the earth is the living substances that needs to be replenished and revitalized through organic mean (James et al., 2000). Soytong

(2001) reported that Thailand is the one of research leader on biological products for organic crop production. The aim is to reduce the application of environmentally non-friendly agrochemicals. Research and development in organic agriculture has been performed with the several known outstanding scientists in this field of microbial biotechnology in agriculture. Soytong et al. (2001) also added that the research for agricultural inputs for organic crop production are released to the organic growers as follows: - bio fertilizer, Chaetomium, Microbial elicitor, Bio-insecticide etc. (George et al., 2001) underlined that to get sustainable crop production, the growers must rely on biodiversity, cultural practices, alternative, environmentally friendly inputs.

Smallholder farmers' households dominate agricultural production in Ethiopia, accounting for more than 90% of total cropped land and producing more than 90% of agricultural output. Smallholders derive their income from agricultural produce either in cash or through self-consumption. Crop, livestock, fisheries, and forestry sub-sectors make up the agricultural sector, according to national accounts. Crop production is the most important sub-sector of agriculture, accounting for more than 60% of agricultural GDP, followed by animal production, which accounts for more than 20% of agricultural GDP (Mulat et al., 2004).

The viability of agricultural production systems in Ethiopia, as in many other developing countries, is severely hampered by degraded soils, disease and pest infestations, and an increasing lack of predictability in rainfall due to climate change (Menale et al., 2010). In terms of climatic zones, food production systems, and socioeconomic conditions, Ethiopian agriculture is diverse. We can say that crop production is produced sustainably when the sector increases the utilization of organic inputs, which increases agricultural productivity and incomes while also building resilience to climate change and lowering greenhouse gas emissions (Harvey et al. 2014).

For a long time in history, Ethiopian farmers have primarily practiced mixed agricultural systems, which mainly are based on tilling and livestock herding but with little change over time

(Diriba, 2020). Nevertheless, agriculture remains the backbone of the country's economy, on which about 34% of the GDP, 83% of employment and about 80% of exports depend. Thus, agriculture plays a critical role in Ethiopia's overall socio-economic development, generating capital (Matousa et al., 2013). The agricultural sector is dominated by small-scale farmers that rely on low-input rain-fed mixed farming along diverse agro-ecologies applying traditional farming methods. However, there have been various factors that challenge the process of increasing agricultural productivity. A range of climatic factors including recurrent drought and flooding often affect agricultural productivity under different farming systems. This situation usually forces some parts of Ethiopia to be aid dependent (Matousa et al., 2013).

The focus of sustainable agriculture is to ensure food security for the present but without jeopardizing the agricultural resource bases needed for the future generations. The important concern in Ethiopian agriculture is enhancing productivity in order to meet the rising demand for food due to the country's growing population while maintaining the resource bases. Most traditional farming practices as they are at present are not in the capacity to feed the growing population. Moreover, the unsustainable way of natural resource exploitation coupled with decline in soil fertility exacerbates erosion of food sources (Deressa, 2007).

Nevertheless, sustainable agricultural practices require improving soil fertility which involves increased soil organic matters and mineral nutrients that support plant growth. Improving soil water retention capacity and diversification are among practices required for increasing farm soil productivity potential. The diversity of crops, livestock and microbes on farms as well as of the relevant plant species within farm environments supports the overall local agricultural productivity. Reduction of the intensive use of hazardous agricultural chemical inputs such as pesticides and protection of soil from erosion through practices such as green cover, in order to conserve soil, are essential measures to be taken for sustaining farm productivity These and many other practices of soil management remain important elements of sustainable and organic agriculture (Grepperud, 1996; Kassie et al., 2008).

Several studies have revealed that organic agriculture is productive and sustainable as it allows an increase of soil organic matter, thereby reducing decline in soil fertility. It also provides means for reducing pests and disease damage to crops and improves soil water retention capacity raising resilience against drought and other impacts of climate change (Smuker et al., 2010).

Organic agriculture in general promotes an environmentally sound, socio-economically beneficial, and culturally acceptable food production system. It can enable the sustainable management of agro-ecosystems and can also provide the opportunity to make better use of local biodiversity resources through which biological dynamics and soil-life-support systems could be maintained (James et al., 2000).

The main aim for the promotion of organic agriculture is to reduce the application of environmentally non-friendly agricultural inputs and to enhance agricultural productivity that can provides healthy food produced under healthy agro-ecosystems. The practices of organic agriculture, therefore, can provide wider options in making use of local biodiversity resources, can enable agricultural practices that are based on rich options, on healthy soils and on environmentally friendly cultural practices with a range of alternatives to maximize productivity.

Agricultural productivity therefore is sustainable when the soil life support systems and the agro-ecosystems are maintained, and farm environments are managed in an integrated manner. An integrated management of farm environments could enable the lowering of greenhouse gas emissions and the building up of local resilience against impacts of climate change (Harvey et al. 2014).

Practitioners of sustainable agriculture take a holistic viewpoint. Rather than just aiming to maximize profit and production in the short term, they prioritize the longevity of the system considering how their farming practices impact the environment, local communities, animals, and every person they encounter on the journey from farm to table. Rather than working against nature destroying forested landscapes, killing insects with harmful pesticides, and depleting soil with chemical fertilizer sustainable agriculture aims to work with the natural landscape, creating a system that's built to last.

Although the word "sustainable" often has environmental connotations, it can also refer to societies, economies, and ways of life. That's why the main idea behind sustainable agriculture is to steward both natural resources and human resources protecting the wellbeing of farmers, strengthening local economies, improving living conditions in surrounding communities, promoting consumer health, and much more.

Sustainable agriculture represents a paradigm shift: Rather than extracting as many resources as possible, it aims to work in harmony with the natural environment, creating a self-sustaining

system that will endure for generations to come. This means shifting away from our current system of intensive, animal-focused agriculture and toward a more efficient, harmonious, plant-focused system. Notably, sustainable and plant-centric agricultural practices can help mitigate catastrophic climate change, while also remaining resilient in the face of extreme weather, drought, and flooding.

Soil itself is a living ecosystem that supports plants, animals, and humans. It's the foundation of our life on earth and, as is the case for any living being, the overall health of soil is of utmost importance. Healthy soil should be able to effectively cycle nutrients to make them available to plants, maintain a strong enough structure to hold water, filter contaminants to clean the freshwater supply, and withstand erosion. Protecting soil health is a key component of sustainable agriculture, which seeks to ensure the longevity of soil rather than depleting it for immediate gain (Altieri,2000).

Perhaps the most magical thing about healthy soil is that it works as a carbon sink, sequestering carbon from the atmosphere. So not only does protecting soil increase its resilience to extreme weather, it also helps mitigate the worst effects of climate change.

Sustainable agriculture can be implemented through practicing organic agriculture and this organic agriculture implemented by using organic inputs. Utilization of organic input includes, conventional compost, vermi compost, bio slurry, organic liquid fertilizer and pesticides.

Agriculture is the main source of livelihood for the residents of Assos zuriya woreda. Smallholder farmers mainly grow crops such as sorghum, corn, and soybeans in this area. However, the region is currently facing a decline in soil fertility due to declining agricultural productivity. Therefore, they use chemical fertilizers to maximize the productivity of their farms. Although this may be a temporary solution to support farm productivity, it affects livelihoods in the long term, factors such as soil acidity are usually caused by overuse. It can cause the farm soil to lose its overall productivity potential. Chemical fertilizer that is a source of nitrogen (Altieri, 2000).

Benishangul -Gumz regional state, especially Asosa zuriya woreda, faces several complex food production and supply problems, mainly due to phenomenological factors and inappropriate interventions in land resource management and exploitation practices. Problems of human intervention include overgrazing, over-cropping, deforestation, and inappropriate agricultural

practices. These lead to problems such as soil acidity and infertility, as well as disease and pest infestation, which are usually caused by disrupting the balance of ecological species, and as a result, production costs increase but productivity decreases. This means that the rate of input use is high and yield as a product is low (Assosa Agricultural Development Office, 2014).

The majority of Ethiopia's agricultural land has been under continuous cultivation for thousands of years, with no proper soil replenishment programs or the use of artificial fertilizers. Chemical fertilizers deplete essential soil nutrients and minerals that are naturally found in fertile soil rather than replenishing them, posing a greater threat to the environment, animals, and human health. Chemical fertilizers will eventually leak into our water bodies, such as ponds, streams, and ground water, contaminating water supplies, exposing humans and animals to a variety of short and long term hazardous chemical effects. As a result, by reducing the adverse effects of chemical fertilizers, we have been able to sustainably boost production and productivity (Michael & Derek, 2007).

The balanced supply of vital nutrients and minerals is critical for soil fertility and crop productivity. As a result, overuse of specific nutrients may induce an imbalance in the supply of soil nutrients, leading to soil deterioration and the loss of a stable soil's equilibrium. Plants cultivated in this manner do not have enough time to mature to generate adequate root growth, strong stems, or nutritious fruits and vegetables, thus artificial fertilizers will help them grow faster, but they will not be healthy and robust. However, we must understand that increasing production and productivity while also feeding the earth is more vital than the crop (Michael & Derek, 2007).

One of the most popular and rapidly expanding movements in sustainability is organic agriculture. The concept, sometimes known as regenerative farming, is at the heart of many emerging food and beverage sustainability initiatives. The program aims to reduce or eliminate synthetic fertilizers, boost agricultural production and yields, encourage biodiversity, preserve water, and trap carbon in the soil. It is often linked to organic farming practices (Pretty et al., 2018). The positive factors of organic farming attached to sustainable agricultural practices include the use of integrated pest management (IPM) plans to reduce pesticide consumption, Crop rotation, the planting of nitrogen-fixing ground coverings or cover crops, and/or the use of mulch can all help to improve soil health, use of no-till or reduced-tillage agricultural methods to

decrease the soil compaction, using soil samples as a guide to determine the amounts of organic and synthetic fertilizer to be applied, promoting the use of organic fertilizers over synthetic fertilizers, avoiding the excessive use of synthetic fertilizers and promoting precision farming through the use of soil samples as a guide to determine the amounts of organic and synthetic fertilizer to be applied, promoting the use of organic fertilizers over synthetic fertilizers, and designing of new irrigation systems to maximize crop or pasture yield while reducing water wastage, erosion, and salinization (Baker et al., 2015; Tchaker et al., 2016; Chaichi et al., 2018; Salim et al., 2020; Merah et al., 2021). This also ensures the utilization of ground cover, and mulches, and limits pesticide usage, among other methods, to prevent soil erosion while highlighting biodiversity conservation. Organic farming is considered a flourishing sector with numerous health benefits and important environmental considerations. People are more concerned about organic products and are willing to pay a greater price for them due to potential health risks. Concern for the environment and a dedication to environmental sustainability also led to resource conservation and a favorable impact on organic agriculture.

1.2. Statement of the problem

Agriculture has been the mainstay of Ethiopia's economy for centuries and will remain so for years to come (Pal et al., 2011). It is considered a pillar of growth for other sectors and the national economy (Atsbaha et al., 2010). However, the development of this sector has been hampered by various problems such as soil fertility, land degradation, pest outbreaks and crop diseases (Akililu, 2015).

Ethiopia's basic food supply has not kept pace with the country's fast population increase (Zerihun, 2009). Adulating the geographical area, very fragmented plots of land, poor soil fertility, small scale holding, conversion of fertile farmland to construction for urban dwellers, climate change, decline of available natural resources, inflation of the price of basic needs, young unemployment, limited mechanization, poor knowledge of farmers, and improper cultural practices were among the major factors that aggravated this problem (USAD, 2015).

The decline of soil fertility in Ethiopia is the reduction of soil nutrients, soil acidity, soil alkalinity and soil shrinkage (Alemayehu et al., 2011; ATA, 2013). Soil acidity is one of the most limiting factors affecting the growth and performance of many crops around the world (Fageria, 2009). It is a natural and human process that forms under conditions of intense

precipitation and massive cationic filtration. Continuous cultivation contributes to the depletion of essential soil nutrients and minerals that naturally form in rich soils. Also, the widespread application of mineral inputs, mainly chemical diseases and fungicides, instead of replenishing the soil, negatively affects the soil nutrient content and soil structure, leading to problems for landforms, organisms, and human health (Zerihun, 2009).

The uneven distribution of human population has been compounded by recurrent land cultivation, resulting in severe degradation of natural resources (Bekele & Drake, 2003). As a result, very poor soil fertility remains a concern in the most productive areas (AFAP, 2012) to meet the ever-increasing need for food Agriculture must be boosted by increasing the agricultural productivity of the most degraded cropping land, which has been cultivated for millennia.

However, due to the differences in agronomic and socio-economic environments in which farmers farm, it is difficult to generalize the determinants of production management strategy selection in different regions of the country, including the study area. The challenges related to production vary from one region to another, some are facing soil acidity problems, others are facing water shortages and disease outbreaks. For example, subsistence farmers in the study area mainly depend on agricultural production and cultivate agricultural products on adjacent land. For residential areas and farms far from residential areas. However, crop yields remain low due to soil acidity and infertility issues. The farmers the study area are also facing the challenges of high production costs caused by the purchase of chemicals and reduced productivity due to soil acidity and contamination by diseases and pests (Shisanya et al., 2009).

Nutrients essential for agricultural growth are not present in sufficient quantities in all soils. Most soils lack one or more of the key components that allow crops to complete their life cycle. When crop plants are harvested, soil nutrient levels can drop over time because nutrients are not restored to the soil. As a result, these vital elements must be compensated either through the natural process of decomposition, in which plants die and decay, and nutrients removed from the soil return to the soil, or through the simple method of fertilizer application.

The study area has reddish soil type. Such type of soil types is affected by soil acidity because of this the communities are suffering by low productivity and high production cost and this study was conducted to fill the gaps of limited research in the area by focusing more magnifying the

role of organic input to attain sustainable crop production. organic fertilizers as the greatest answer for avoiding soil degradation and acidity, ensuring sustainable production, and a variety of other hazards to the environment and human life caused by the overuse of chemical fertilizers and pesticides. Because chemical fertilizers do not enable enough water input for the plants, they might cause root burn or fertilizer burn. Chemical fertilizers are heavy in nitrogen salts, and if the nitrogen is taken too quickly by the soil, the plant will become dehydrated and dry. Furthermore, inorganic fertilizers can contaminate groundwater (Mengistu, 2011)

Therefore, the perspective of supporting farmers needs to fully understand the complexity of the problem associated with reducing productivity. This requires the introduction of appropriate technologies and solutions that allow production of the best products in terms of crop yield, but with low production costs. One of the strategic measures can be an agro-ecological approach and practice as one of the extension packages to restore the productivity of agricultural land and degraded agricultural environment.

Therefore, this study focuses on the use of locally improved organic agricultural inputs as one of the agro-ecological approaches for sustainable crop production. Such an approach can increase productivity while maintaining the health of the soil environment and reducing problems such as soil acidity, and pest and disease attacks. However, especially the promotion of organic farming practices and the establishment of an agro-ecological approach support appropriate policies and suitable technologies that farmers can use.

1.3 Objective of the study

General objective

The general objective of the study is to study the role of locally improved organic agricultural inputs, use for sustainable crop production in Benishangul Gumuze, Assosa Zuriya woreda.

Specific objectives

Specifically the research intend to:-

i. Assess the practice of locally improved organic agricultural inputs utilization for crop production.

ii. Analyze farmers adoption of locally improved inputs utilization by study area communities.
iii. Analyze the impact of locally improved organic input utilization for sustainable crop production.

1.3. Research questions

The study tries to answer the following questions.

i. How this locally made organic agricultural inputs contribute for the sustainable crop production?
ii. What outcome/result is observed in the study area after utilizing these locally made inputs?
iii. What strategies are implemented in the study area to expand the adoption of utilizing the locally made organic agricultural inputs?

1.4. Significance of the study

A study on the role of locally improved organic agricultural input use is relevant in promoting sustainable crop production while reducing the negative impacts of chemical fertilizers and pesticides use on human and environmental health. The findings of the study will help to better understand the relationship between organic farming and sustainable production and the contribution of locally improved inputs in achieving sustainable crop production.

The study will have a positive contribution for the communities or societies in different aspects. This include economic benefits as their income will increase with low production cost, health benefit from the negative impact of chemical pesticides in their health in addition to that consuming organic vegetables are more vital for health as the can protect form noninfectious diseases.

It can also assist decision makers in developing effective intervention policies and practices. In addition, this finding can be used by district experts and kebele development experts to increase the knowledge of local people. Finally, the findings and conclusions of this study can be used as a reference for scholars for further research areas targeting locally improved organic agricultural

inputs as well as help expand the knowledge base in relation to locally improved organic agricultural inputs.

1.5. Scope of the study

This study aims to demonstrate the contribution of organic input utilization to sustainable crop production. For this purpose, the research was carried out in Benishangul Gumuze region, Assosa Zuriya woreda by selecting three kebeles from the existing forty-two kebeles in the woroda. The main productivity challenge in the region is the drop in productivity due to various reasons. In order to understand the main issues related to production and productivity decline, data on farmers' perceptions and awareness of the issues were collected through questionnaires and focus group discussions. The household survey was done through questionnaire, and it is done on the communities that uses organic fertilizer and inorganic fertilizer. Data was also collected from primary and secondary sources, while relevant literature from secondary sources was brought. In general, the research and documentation took about three months to complete.

1.7 Limitation of the study

The research conducted in Benishangul, Assosa Zuriya Woreda, western Ethiopia, and it addresses only the limited kebeles due to time and financial constraints. In addition to this the research did not identify the availability of macro and micro elements on the prepared and utilized solution of organic fertilizer and pesticides as an organic input.

1.8 Organization of the study

This research consists of five chapters. The first chapter introduces the research context. This chapter gives a complete description of the content of the study. This is done by stating the purpose of the research and determining the research questions. The second chapter is a review of related literature. In this context, the theoretical and geometric aspects and the conceptual foundations of the study are presented. Finally, the third part of the research is about the methods used to collect data from primary and secondary sources. Empirical analysis of data collected through questionnaires, interviews, and focus group discussions. Finally, the fourth and fifth chapters of the study include findings and discussions and conclusions, respectively.

CHAPTER TWO

LITRATURE REVIEW

2.1 Theoretical literature review

2.1.1 Definitions of technical terms

Organic inputs – derived from the processing of plant and animal products that farmers bring to their crops to express the finality of the product (Arthur et al., 2022).

Organic Farming - farming that promotes soil, ecosystem and people's health is known as "Organic Farming". it uses natural processes, biodiversity and cycles that are compatible with basic conditions rather than hazardous inputs (IFAOM, 2008).

Sustainable agriculture - focus on growing crops and animals for the long term with minimal environmental impact. This type of development seeks to find the right balance between the need for food products and the protection of the ecosystem in the environment (Worner and Krall, 2012).

2.1.2 The Future for Organic Agriculture

Organic agriculture is the better option for development because of the principles underlying it. Issues such as right-based approaches, land tenure issues, land grabbing, women's empowerment, land degradation, resilience, participatory food system governance, perverse subsidies and unfair trade policies, protection of ecosystem functions, nutrition, rural-urban linkages, food waste, deforestation, diversity and adoption of climate smart agriculture practices (largely based on existing organic practices) are now increasingly seen as part of the holistic approach needed to effectively nourish the ever increasing population through simultaneously eradicating extreme poverty (IFOAM, 2013).

Organic nutrient management is the practice of supplying plant nutrients by using organic sources of nutrients such as organic matter, farmyard manure (FYM), compost, vermicompost, oil cakes, green manures etc. In organic farming, suitable crop cycles and rotations also contribute a lot for enhancement of soil fertility. The advantages of using organic manures into soil include increased water storage capacity and improved infiltration rates (Nayak et al., 2012; Maitra et, al., 2018). Benemann et al. (2018) reported that the major concern of plant nutrient management, according to organic farming principles is the buildup and maintenance of soil

fertility and the soil's ability to supply water and nutrients for plant growth and reproduction. Nutrient cycling in soil under various nutrient management practices and organic nutrient use, as well as developing effective nutrient management strategies for increased crop yield, soil health and long-term sustainability (Venkatesh et al., 2017; Maitra et al., 2018a). Organic matter has been used to increased soil health and plant nutrient supply since long time. The use of organic manures improves the nutrient uptake and plant uptake and improving soil fertility and productivity for essential (Vidyavathi et al., 2012). Bhattacharya and Dey (2014) reported that the application of organic manure was found to be more successful than inorganic fertilizer treatments. The long-term productivity of agro ecosystem depends on the maintenance of soil organic matter. During recent time, organic agriculture is catching up in the country where organic inputs play significant role in plant nutrition. Soil is the most important factor in plant growth and development and soil physical, chemical, and biological properties are better maintained by the application of organic manures. Further, green manures improve soil biomass and increases soil microbial activities and fertility. (Paul et al., 2006).

2.1.3 Transition from organic farming to inorganic farming

The origins of modern organic agriculture are linked to the emergence of today's "industrialized" agriculture. Many organic farming practices were the only options available to farmers before the advent of chemically synthesized fertilizers, biocides, pesticides, mechanization, and fossil fuels that made industrial agriculture possible. Without using such technology, farmers have no choice but to work in biological and ecological systems. For example, the only source of nutrient replacement from plants is human and animal manure and green plants. Failure of crop rotation leads to an increase in pests as there are no pesticides to control them (Archana, 2013).

From this point of view, organic farming is a unique and mainstream agriculture, and is a deviation from the "conventional" artificial farming practices that have been practiced since the beginning of agriculture. This division between artificial and organic agriculture goes back to the beginning of the 19th century, when it was discovered that plants absorb dry mineral salts and are regulated instead of organic matter. Sir Humphrey Day and Justus von Liebig were important authors of this proposal and published their ideas in Principles of Agricultural Chemistry and Organic Chemistry in Agriculture and Physiology (Paul et al., 2006). Their argument is that

inorganic mineral salts can replace coprolites with increased productivity and efficiency, bringing agriculture into the scientific fold. The rural revolution began in the 1840s, and with it came the first commercial non-organic disease products. However, as with many revolutions, it was not until the outbreak of World War II that a significant increase in disease occurred due to miscalculation (Grigg, 1989).

2.1.4 Principles of organic farming

Organic farming is based on a comprehensive methodology. Nature is more than a separate unique thought with a solution. Agriculture's principles and ideas are based on ecological knowledge, or the impact of living creatures on their surroundings. Organic farming largely eliminates synthetic inputs, fungicides, herbicides, and diseases, and focuses on adequate natural processes such as composting and other practices to maintain soil fertility, natural pest control, and plant and animal diversification. Organic farming emphasizes long-term ecological health, as opposed to short-term profit-oriented subsistence agriculture, similar to biodiversity and soil quality (Trewayas, 2001). Therefore, Organic agriculture has been defined by the US National Organic Standards Board (1996) as "an ecological product management system that promotes and improves biodiversity, natural vigor.

2.1.5 Sustainability and organic agriculture

It should be known that agriculture has changed dramatically since the Green Revolution. After the Green Revolution, agricultural productivity increased due to robotics and the introduction of new technologies. The main advantage of these robotics is to reduce labor and increase crop yield. With the promotion of technology in agriculture, many positive results have been achieved. With higher yields, in addition to labor costs, plant and labor costs have decreased. Food security was also achieved after the green revolution. But going green comes with some downsides. The final result of the green revolution was observed in the reduction of sedimentation, groundwater pollution, increase in product cost and decrease in family income (Pimentel et al., 2005).

Sustainable farming is considered a farming method based on ecological principles. This is an interconnected system with special applications that have long-term benefits of factory product experience. Sustainable crop production is not only food that must die, but also improves the

quality of the land and the quality of natural resources (Gold, 2009). Organic farming is a long-term strategy that will improve the region through sustainability. Food security will benefit significantly from this agricultural strategy. A gradual transition to conventional organic cultivation is necessary to increase sustainable crop varieties (Azadi et al., 2011).

2.1.6 Soil health and sustainability

In the early 1990s, the concept of soil quality began to appear in the literature (Doran and Safely, 1997; Wienhold et al., 2004). Soil quality refers to the ability of soil to function in natural or managed ecosystems to support plant and animal productivity, maintain or improve water and air quality, and support ecosystem and habitat health. It is also defined as "the ultimate result of soil to serve the ecosystem and land use, maintain natural productivity, maintain environmental quality, and increase plant, animal, and mortality risk" (Doran and Parkin, 1994). It consists of three parameters: trade-offs, density, and physical, chemical, and natural soil quality, all of which must be restored to optimal conditions over time to support low productivity conditions. Finally, the terms soil health and quality are often interchanged (Karlen et al., 2001), and it is important to note that soil quality is related to soil function (Karlen et al., 2003; Letey et al., 2003), whereas soil health depicts the soil as a finite, non-renewable, and dynamic living resource (Doran and Zeiss, 2000).

2.1.7 Soil acidity problem and its solution

Soil acidification is accelerated by crop production practices that use nitrogen fertilizers, such as urea, ammonium sulfate, or other fertilizers such as ammonia N, to increase crop yields. This problem can be managed by using organic farming practices and conservation practices. The use of organic agricultural inputs increases the availability of essential nutrients, which in turn increases the yield and productivity of agricultural crops (Anderson et al. 2013). In addition, it promotes microbial function in the soil and improves soil structure; Thus, increasing root growth and nutrient absorption efficiency (Change, 2015).

Organic matter such as crop residues, compost, dead roots, liquid fertilizers, root material and garden manure contribute to soil life and crop yields. This organic residue is responsible for increasing organic matter, supporting soil life, and continuously increasing plant metabolism and productivity (Benjamin, 1984).

Lack of adequate nutrients, depletion of soil organic matter, and soil erosion are the main challenges for sustainable agricultural production in the soil resulting in decreased soil health and increased plant susceptibility to insects, pests, and diseases (Tura et al., 2017).

2.2 Empirical literature review

Environmental preservation and support for human progress in all spheres—physical and social—should go hand in hand. A sustainable agricultural system must address environmental, economic, and social sustainability challenges in addition to inputs and technologies. As a result, ecologically friendly production methods must be adopted, notably in the food industry, which is the core of organic farming techniques. In order to create agricultural ecosystems that are economically, socially, and environmentally sustainable, organic production systems are founded on exact and detailed production standards (Bellow, 2008).

Organic agriculture (OA) is a type of agriculture that is considered particularly environmentally friendly because it is based on the intertwined concepts of health, environment, equity and compassion (IFOAM, 2021). For more than two decades, political support for OA and its environmental benefits have been the subject of intense political and scientific debate (Sanders, 2016). Several authors consistently provide empirical evidence for the relative benefits of OA (e.g. Reganold and Wachter 2016; Stolze, 2000).

According to Regnold (2001), organic agriculture aims to improve soil fertility by creating optimal soil conditions for plant growth. Improving soil health by improving physical, chemical and biological aspects of soil. The relationship between soil organic matter and agricultural productivity has been documented in the literature. For example, (Agboola and Omueti, 1982) considered that crop response to fertilization is influenced by soil organic matter availability. According to Hue (1992), soil acidity, excess aluminum, calcium deficiency and poor organic matter are among the challenges facing tropical soils. (Cook and Ellis, 1987), addition of organic matter is the only way to produce some soils economically. Consequently, organic supplementation is synonymous with soil productivity (Richard et al., 2000). Increasing soil organic matter has the added benefit of improving soil quality and increasing the long-term viability of agriculture (Laird, 2001).

Agboola (1970) concluded that soil organic matter is determined by the cat's ion exchange capacity and the amount of nutrients in the soil, especially N, P, K, Mg, S, Zn and Cu. In his essay, Lukas Kilcher (2007) showed how organic farming contributes to sustainable development. Research conducted by Juan, Tomes, Diego indicate the profitability and social sustainability through implementing organic farming, Valera Luis, Belmonte and Carlos Herrero Sánchez (2016) showed that in terms of profitability, the profitability of organic crops is higher than conventional agriculture. It also shows a significant increase in employment from a sustainability perspective. Sisay and Daniel (2021) stated in their research that it is impossible to talk about improving agriculture in feeding the increased population without maintaining soil fertility, so soil fertility must be maintained for the long term and adequate crop production tonnage. carried out.

Farmers can switch from chemical inputs to a holistic approach based on agro-ecology and improve the quality and quantity of their produce. Reintroducing biological complexity, including increased plant diversity, annual cover, and the presence of trees, requires an integrated strategy. This will increase food production efficiency, profitability, and environmental benefits (FAO, 2015). In North India, Saniha et al., (2013) study showed that organic farming can provide high quality food without adversely affecting the health of the soil and the environment.

2.3 Conceptual framework

The conceptual model shows the correlation between organic farming and its positive impact on terrain, frugality and social. It's developed grounded on the below problem statement. The study is grounded in Asosa zuriya woreda Benishangul Gumze region, on the part of exercising locally bettered agrarian inputs for sustainable drop product. Sustainability is a three- dimensional conception that encompasses profitable, environmental, and social aspects (Dinpnah et al., 2014). Therefore, the capability of any sector to support a defined position of development is directly linked to the fulfillment of the principles of sustainability (Surveying, 2008). In this environment, the shift from conventional to organic agriculture practices can contribute to the sustainability of those areas that would be else at threat of abandonment, (Chaichi, 2009). Organic agriculture thus has the implicit to give advanced livelihood openings, increased income, and social benefits for resource-poor small- scale growers who can use organic inputs.

Organic inputs can be made from the processing of factory and beast products that growers apply on crop granges to ameliorate crop productivity. The most habituated organic inputs are ordure, memoir slurry, bio toxin and green compost prepared by putrefying and stirring organic accoutrements. Different accoutrements including factory corridor and crop remainders, beast soil and organic wastes are used to prepare organic diseases in solid and liquid forms. Beast matter can frequently be mixed with vegetable matter to get compositions or results with balanced rate between carbon and nitrogen (Jennifer, 2020) to give nutrients directly to the factory via soil or by scattering on the splint, playing a part in guarding crops from pests and complaint (Faure et al., 2018). Organic matters in solid forms can ameliorate the soil physical, chemical, and natural parcels. In general, organic inputs stabilize the position of organic matters in the soil which in turn provides a range of social, profitable, environmental, and agrarian benefits. It contributes by perfecting the soil structure and nutrient quality, stimulating soil natural conditioning including the enhancement of soil water retention capacity, tillage facilitation and factory health (Jennifer, 2019).

Social benefits include health, income generation, job creation that can minimize rural migration, etc. Economic benefits involve reduction of production costs and diversification of incomes and low risk of crop loss. Agriculture benefits include the production of food sources of better nutrient quality, improved soil fertility and soil microbial activity and minimization of impacts of plant pests and diseases on productivity. Environmental benefits involve reduction of farm soil and farm environment pollution, conducive conditions for pollinators, enriched soil nutrients and improved soil health with positive impacts on agricultural productivity. The right application of organic inputs enables clean environment and improved crop productivity which directly contributes to the enhancement of the livelihoods of small-scale farmers.

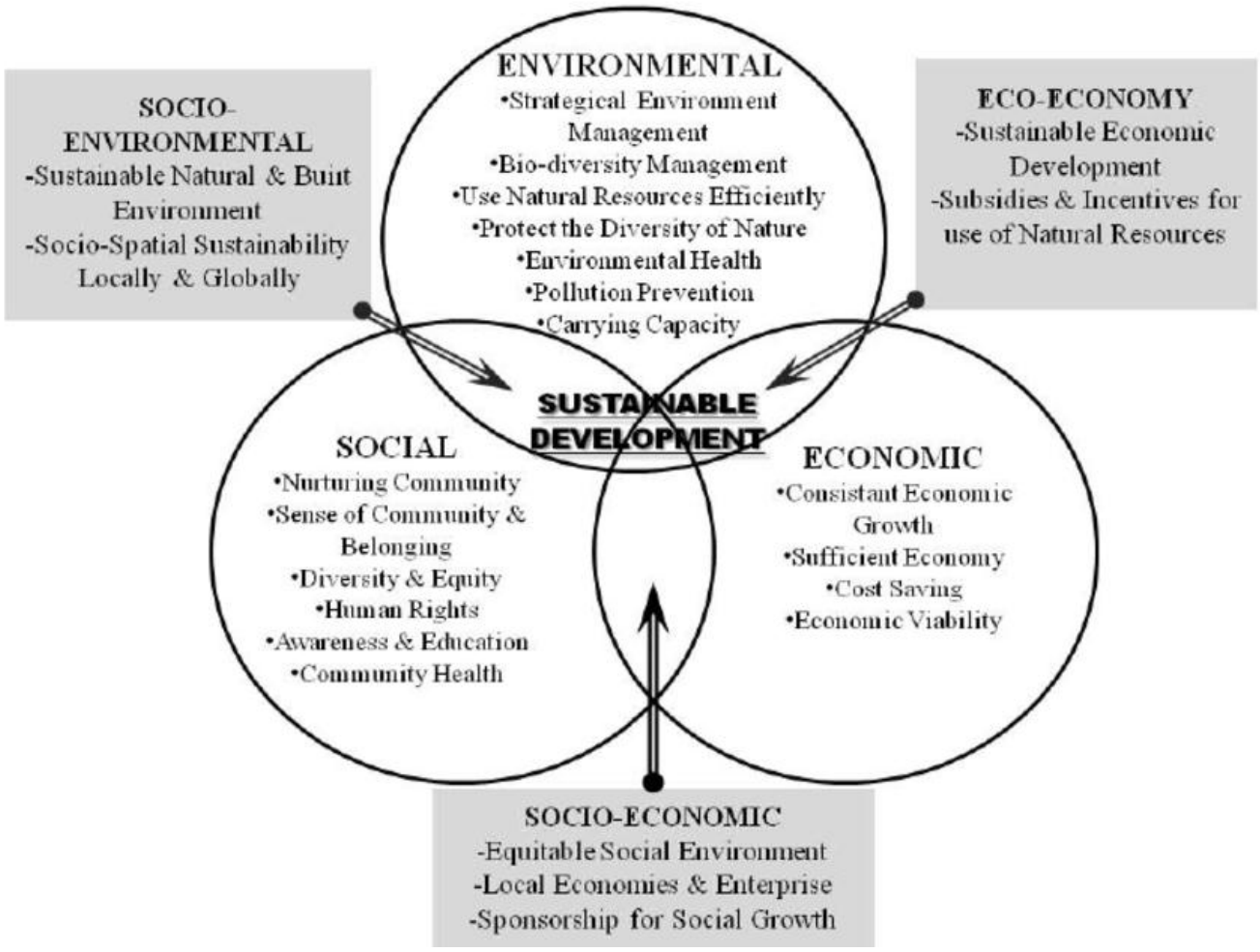


Figure 2.1: Conceptual Framework adopted from knox

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Description of the study area

The research conducted in Assosa Zuriya woreda, Benishangul-Gumuz Region, western Ethiopia. Asosa zuriya woreda is bordered with Kurmuk and Komesha in the north, with Menge in the northeast, with Oda Buldigilu in the east, with Bambasi in the southeast, with Mao-Komo special woreda in the south and with Sudan in the west. Asosa zuriya woroda has a latitude and longitude of 10°04′N 34°25′E, with an elevation of 1,570 meters.

This Woreda is named after its largest settlement, Asosa. Rivers include the Yabus and its tributary the Buldidine. Assosa zuriya woreda is one of the regional woredas that have similar problems of poor productivity. It is highly populated with dominating subsistence farming with limited livelihood options.

The 2007 national census reported a total population for this woreda of 104,147, of whom 52,968 were men and 51,179 were women; 24,214 or 23.25% of its population were urban dwellers. The majority of the inhabitants said they were Moslem, with 63.27% of the population reporting they observed this belief, while 31.18% of the population practiced Ethiopian Orthodox Christianity, and 5.23% were Protestant.

Based on figures from the Central Statistical Agency in 2005, this woreda has an estimated total population of 102,732, of whom 53,340 are men and 49,392 are women; 20,226 or 19.69% of the population are urban dwellers. With an estimated area of 1,991.41 square kilometers, Asosa has a population density of 51.6 people per square kilometer which is greater than the Zone average of 19.95.

The agro ecological zone of Assosa district is identified as Kola with an average temperature of about 27°C. The rainfall pattern of the district is mono-modal, and the rainy season starts in May, extending to October. The dry season starts in November, extending to the end of April having a wider temperature range, with too cold mornings and nights during and too hot during the middays of the onset of the season. The dry season of the district is also windy and cloudy

nature. The annual rainfall ranges between 900mm to 1400mm. Crops are cultivated solely during the rainy season of the district (Assosa Agricultural Development Office, 2014).

In Assosa zuriya woreda the major economic activity is farming. Most of the dweller's livelihood is rely on farming practices. This includes the rearing of animals and producing of crops. Crops like sorghum, maize and soyabeans are the major crops that grown in the area. In addition to those fruits like Mango, banana, papaya, coffee is grown in the area. Som farmers grow vegetables like cabbage, head cabbage, carrot, tomato, and onion and uses for household consumption and market. Most of the dweller's rare animals in their home, animals like small ruminants, donkey cow and oxen are common in each household. In this region the soil type is reddish. Such types of soils are mostly affected by acidity problem. Due to this and other reasons the agricultural production and productivity become decreasing from time to time in the area. The communities utilized inorganic input to increase their production and productivity.

In Benishangul Gumuze there are twenty woreda, out of it Assosa zuriya is one of the worda. This woreda was selected to conduct the research as there is start up activities in the area regarding utilizing of organic inputs.

Assosa Zuriya woroda has forty-two kebeles but the study was conducted in the three Kebeles out of the forty-two, namely Abramo, Megele 32 and Megele 33. The kebeles are selected with the consultation of the woreda agricultural experts. The three kebeles are neighbors and located at about 20km away from the capital town of the region. The farmers in these kebeles practice farming on very poor red farm soils (omnibus) with high levels of acidity. Major productivity challenges of the district therefore involve intensive application of chemical fertilizers and other inputs, leading to non-intervened cultivation of farms that exhausts the farm soil's productivity potential. This situation remains one of the main causes for soil infertility and soil acidity. Being coupled with problems caused by termites and crop pests and diseases, soil acidity is growing to be the critical challenge of farm productivity in many spots of the woreda.

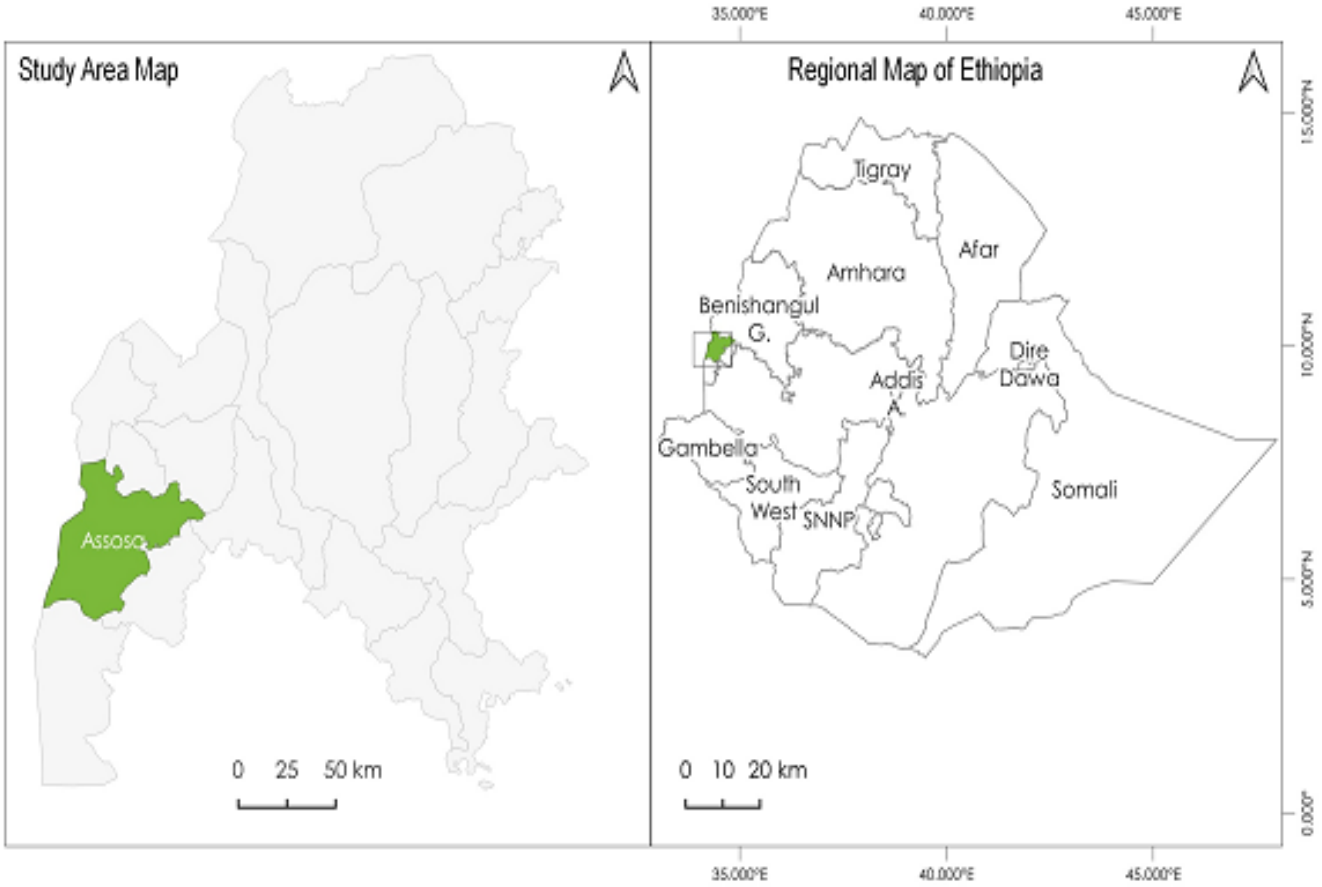
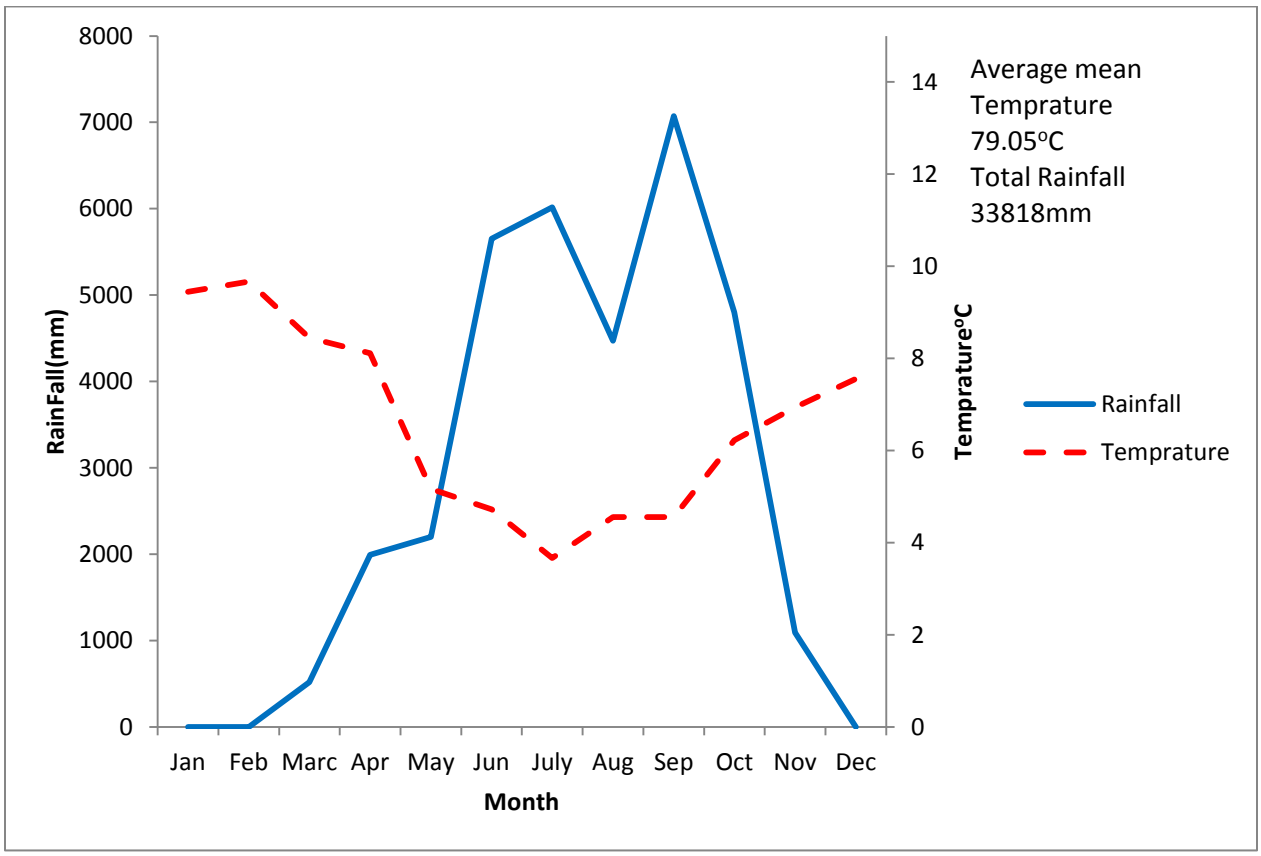


Figure 3.1:- Location of Assosa Zuriya Woreda

Figure 3.2 shows the average temperature and rain fall of Assosa zuriya woreda. According to the data accessed from Benishangule Gumuze Metrological service center the average mean temperature and the total rain fall of 2021 is 79.05^{0}C and 33818mm respectively.



Source:-Benishangule Gumuze Region Metrological Service Center

Figure 1.2:- Climate data for Assosa zurizya woreda

3.2 Research method

3.2.1 Study design and approach

Descriptive research design was used to study the role of locally improved organic agricultural inputs utilization for sustainable crop production. It is a type of research design that aims to obtain information to systematically express the context in relation to the situation, phenomenon, or population. As a result, it enables the researchers to collect data from many respondents on utilization of agricultural in increasing their production and productivity. The research employed in this study was mixed research method in which, both qualitative and quantitative data

collection methods were applied in such a way that quantitative research is a research method that is used to generate numerical data and hard facts, by employing statistical, logical and mathematical technique while qualitative research is used to get an in-depth understanding of motivations ,experience, attitudes, and intentions of human behavior on the basis of observation and interpretation, to find out the way people think and feel (Ahmad et al., 2019). Thus, data were generated through survey questionnaire, focus group discussion and key informant interview to assess the role and contribution of locally improved organic input utilization for sustainable crop production.

3.2.2 Data source

The study was carried out by collecting primary and secondary source data. Both methods are pertinent in obtaining data for the study. The data collected from primary sources would be used in both quantitative and qualitative data types. Quantitative data was primarily obtained through household survey, whereas qualitative data was generated through Key Informant Interviews (KIIs), Focus Group Discussions (FGDs) and field observation.

Secondary data is defined as the research data that has been already gathered and can be accessed by researchers. These types of data could tell us the existing documented information relevant to the study objectives that could be raw, semi processed or processed ones like publications, reports and written documents, medias, policies and strategies of the government, etc

3.2.3 Sampling procedure and sample size

According to Singh and Masuku (2014), the sampling technique and sampling size determination have a crucial role in survey-based research problems in applied statistics. Conversely, sampling techniques are usually used for research investigations to better estimate at low cost and less time with greater precision. Having this consideration on sampling technique, there are many ways to draw a simple random sample such that the most common way to take the sample is the lottery method. In addition, cluster sampling is a sampling method that randomly selects samples from the groups that the complete population is divided into. The sample consists of every observation in the chosen cluster. To ensure that every unit in the sample is sampled with the same probability, as in simple random sampling, cluster sampling is a sampling technique that is employed when the statistical population is separated into natural yet homogenous clusters.

When the population is homogeneous, this technique yields more accurate parameter values since it is impartial.

Zikmund (2003), the one who provided a simplified formula to determine the sample sizes as a result the formula was used to calculate the sample sizes with a ninety five percent confidence level and a maximum variability in a population of 0.5. Therefore, the following formula (Eq. 1) was used to estimate sample size.

$n= Z^2 P/E^2$…… Equation (1)

Where, n is the sample size, z is the selected critical value of desired confidence level, p is the estimated proportion of an attribute that is present in the population, q = 1-p and e is the desired level of precision.

Selection criteria: - The woreda is purposefully selected owing to get better information on the result obtained by utilizing organic input in minimizing the major challenge observed in the woreda. In total the survey covered 138 households for the woreda. Number of samples kebeles was determined purposefully and decide to have three kebeles as these kebeles are suffering by declining of soil productivity and getting low the product and also these kebles to extent started utilizing of locally improved organic agricultural inputs and they are in position of getting good results. So, the major criteria in selecting the kebeles were: the start-up of producing and utilizing of improved organic agricultural inputs for soil fertility enhancement and crop protection, decrement of soil fertility and soil acidity problem.

Subsequently three kebeles were purposefully selected based on the above selection criteria using information obtained from the woreda agriculture office. Accordingly, Abramo, Megelle 32 and Megelle 33 kebeles were selected for the survey.

After the selection of the sample kebeles, sampling of survey households was carried out from the list of households residing in the sample kebeles by the help of woreda agricultural experts. Household sampling intervals were determined purposefully in such a way that by nominating number of households (HHs) that starts utilizing of organic agricultural input. The selected households started utilizing these inputs from the knowledge gained through practical training which is given by the NGO that mainly focuses on promoting of agro ecological practices. The

main reason for calling improved local input is the inputs that introduced for the surveyed communities have better improvement from the previous one, conventional compost, manure, bio slurry known before but vermi compost, organic liquid fertilizer and biopesticides are new technology that get some improvement. Next, HHs randomization was performed indiscriminately among utilizers of inorganic agricultural inputs with the help of woreda agricultural experts by lottery method from the kebele HH list. The first HH was randomly selected from the list by lottery method and then sampling continues by increasing the sampling interval until the required sample size is reached. In cases where, due to unforeseen circumstances, the HH head or husband sample is not available, the sample is replaced by selecting only the first or first name of the household selected from the list. In addition, that the participants for FDG and respondents for key informant interview purposively selected as well based on the stated criteria. After all, besides to the household survey ten in depth key informant interview, three focus group discussion were held. Moreover, information could also be gathered from, government organization, research center, NGOs and households that found in the woreda.

Th three kebeles have 5,565 households in total i.e Abramo, 3,455, Megele 32, 907 and Mgelle 33, 1,203. Out of 5,565 households 138 households identified for survey questionnaire using the sample size determining formula. since the focused and practical training on preparation and utilization of locally improved organic agricultural input and started utilizing of it, it is assumed that the community living in the study area at least has hint about the activities related with the utilization of agriculture input to increase production and productivity by resolving the observed problem in soil infertility and disease and pest.

Then by using Zikumnd (2003), formula the sample size could be determined. So the sample size was:-

$n= Z^2pq/E^2$

Where; n= the size of the sample

p= the estimation of the population assumed to be knowledgeable to involve

q= the estimation of the population who do not have information concerning the

Z= standard value corresponding to a confidence level

E= acceptable magnitude of error

Considering the utilization of organic agricultural inputs in the study area less than 10% of the population assumed to have information about it. So that the value of P is equal to 0.1 and q (1-0.1) is equal to 0.9, when the parameter in population is assumed to over 90% or under 10%. The 95% confidence level standard value Z, 1.96 implies that the sampling error is not greater than 5% therefore,

$n= z^2pq/e^2$ $n= (1.96)^2*0.1*0.9/(0.05)^2$; n= 138

The sampled proportion was distributed in each kebele purposefully by the number of households with the help of woreda experts on each kebele,

proportional is follows nh=(Nh/N)n

Where Nh= population on each woreda, N= total household population, nh=total sampled population.

Table 3.1: Table showing total household population (N) and sample size (n) of the study.

Name of woreda	Name of kebeles	Total population	Sample size
Assosa Zuriya woreda	Abramoo	3455	86
	Megele 32	907	22
	Megele 33	1203	30
Total		**5,565**	**138**

The table showing total household population (N) and sample size (n) of the study

Total number of 138 respondents intended to be visited for face-to-face survey questionnaire; all of them were surveyed at their home by the help of enumerators. Hence in this study the response rate was found to be 100% for the household survey.

Data Collection:- Both primary and secondary data were collected for the study to achieve the desired objectives. Thus, primary data collection started by designing a good and appropriate questionnaire. The questionnaire was tested and verified on a pilot survey, and it was good.

Documents like research results, documents and other literature were also used as secondary data in the research.

Quantitative data was generated through a structured questionnaire survey. In addition, qualitative data were generated using focus group discussions (FGD) and key informant interviews (KII). The study variables are the smallholder farmer that utilizes organic input in combination with inorganic one and smallholder farmer that uses inorganic input only. The number of households that surveyed from inorganic and inorganic input was ninety-five and forty-three respectively. This is divided purposefully with the help of woreda agricultural office experts so as to magnify the role of organic input utilization. The household survey which is done in each kebele based on their utilization as a result of this in Abramo Kebele seventy-five organic utilizers & eleven inorganic utilizers surveyed, Megele 32, ten organic utilizers & twelve inorganic utilizers surveyed and Megelle 33 ten organic utilizers & twenty inorganic utilizers surveyed. In General, FGDs were conducted on each sample group of Kebele people to augment data collected through household surveys. A total of three FGDs were conducted, one FGD per Kebele. The reason why we selected one FDG from each kebele is the number pf the total population is not much, and utilization of organic input is started in a very limited area because of that the data collection discussed and decided that enough information can be with on FGD fro each Kebel with a very purposeful selection of the FGD team. Each FGD consisted of 8-10 participants, this is done to manage the discussion properly as the number becomes more it will be difficult to manage the discussion. In Each focus group discussion women participants accounted 4-5, appropriately represented by gender, age, and social class. FGD participants were selected based on predetermined criteria in collaboration with woreda agricultural experts, the some of the criteria were people that live long in the area, work with the community at grass root level, having better understanding about local inputs and based on this FDG recruited triads from Kebele residents, government agencies, development workers, research centers, and NGOs. This criterion was also implemented for the respondents with KII with Woreda Agricultural Extension Officers and Project Coordinators. A total of 10 KIIs were conducted and the selection of KII participants was based on the participation of communities, agricultural offices, project coordinators (NGOs) and extension workers. The face-to-face interview was conducted after examining the household. Out of ten KII five interviewers were women.

As mentioned earlier the data was obtained from 138 household heads who are engaged in farming practices. The household survey is done with the help of enumerators who live in that woreda.

Procedure: - Afterwards enumerators were recruited and trained for the household survey from the woreda with woreda agriculture offices. Their training focused on survey procedures and methods, questionnaire, and ethical consideration. To reduce communication barrier among enumerators, respondents and researchers, the survey questionnaire Each question of the household interview was written in both, Amharic and English at the preparation stage. With all these, the researcher with the enumerators conducted a questionnaire pre-test in non-sample kebele of Assosa zuriya woreda which is Mender 52, and this helped the researcher to improve it before conduction. Then, primary quantitative and qualitative data were collected through household survey, focus group discussion (FGDs) and key informant interviews (KIIs). Researchers intensively supervised the survey which is conducted during May 2022.

3.4 Method of data analysis

Data cleaning was done before encoding the data in SPSS pre-made data entry template. It was followed by quality assessment of the entered data by the researcher using randomly selected (10%) raw data to guide the entry and make corrections. The collected data from different sources were coded for tabulation and interpretation based on its nature by using descriptive statistical analysis method. Qualitative data was analyzed according to its nature and helped to vindicate the quantitative data whereas the analysis of quantitative data generated through household survey was carried out using descriptive statistical which is Statistical method for social sciences (SPSS). Hence the collected data were presented using SPSS and presented using percentages and tables. Besides non- parametric test like Pie charts were used in the data analysis. In addition to that, Chi-square test was used to test the relationship between categorical data (Ugoni et al., 1995).

3.3 Ethical consideration

As a study involving deceased participants, research proposals and evaluation instruments were submitted and approved by my advisor on behalf of Addis Ababa University to comply with the university's ethical norms and regulations in accordance with national and international ethical

principles. At the same time, before starting the questionnaire/interview, the enumerators informed each respondent about the purpose of the study, the data management strategy, and the privacy statement, asked the wishes of the interviewee, and informed them that they could leave the interview at any time. when they feel uncomfortable. Therefore, it was counted (4 individuals) all the interviews with 138 respondents who gave full consent to be interviewed. In addition, codes were used during analysis and reporting rather than using respondent names or other characteristics that could lead to identification. According to the agreement with the respondents, all data and information used for research purposes are kept confidential and always maintained in accordance with national and international ethical procedures.

CHAPTER FOUR

RESULT AND DISCUSSION

4.1 Respondents background characteristics

4.1.1 Age

Table 4.1 shows that the average age of respondents who practiced locally improved organic agricultural input (LIOAI) was 43.81 years, compared to 44.5 for their counterparts. As indicated, there is no significant age difference but to some extent communities who practices LIOAI are lesser than those who didn't practices and can still learn easily about the practice and utilization benefit of locally improved organic input and have ability to implement by simply observing user manual, learning videos and exchange visits which means they have good ability to adapt new technologies. This has its own implication in terms of ensuring sustainable crop production which in turn has positive impacts for soil fertility enhancement and safe environment sustainably.

In relation to this Hsu (2019) underlined that aging and work are dependent to each other, especially activities that related with adoption of new technologies, some physical activities/works etc. When someone gets older can face more barriers and stress to work such as physical strength limitations and health concerns, gaps related to new technology adoption and engagement in work. Gulielmi et al. (2016), examined the gain cycle from work demands to job satisfaction and younger worker responds better than the old worker.

4.1.2 Education

As shown in Table 4.1 respondents that practices LIOAI about 11.6% were illiterate, 23.2% have reading and writing skill, 33.7% reached elementary education level, 25.3% have attained junior school and the remaining 6.3% attended high school education. On the other hand, out of the total respondents who didn't practices LIOAI about 7% were illiterate, 23.3% can read and write, 39.5% have received elementary education, 25.6% have attained junior school and the remaining 4.7% attended high school education. This indicated that most of the respondents were educated.

As a result of this, they can easily understand the training given through the capacity building program (Asfaw, 2015). Even if the number of literate that practice utilizing of organic input is greater than form the inorganic it is a good indicator to proceed with the implementation of utilizing this input because most of the activities have linkage with traditional knowledge. In addition to that they can think more and upgrade the introduced technologies by doing different trials and work more to scale out to the community. Moreover, introducing activities for the community that utilize inorganic input will be easy as most of them are educated. The awareness creation and capacity building regarding the utilization of locally improved organic agricultural inputs can be done easily through practical training, exchange visit, training video and manual as they can understand easily and practices it as fast as possible. In this regard, it is well known that education is an important issue in one's life as it is the key for success in the future and to have different opportunities in life (Stephenson et al., 2012) Having education helps people to think, feel and behave and in a way that contributes their success and improves not only their personal satisfaction but also their community. In addition to that it helps in having self-confidence. The educational background of sampled household heads is believed to be an important feature that determines the readiness of the household head to accept new ideas and innovations (Asfaw, 2015).

4.1.3 Household family member

The result in Table 4.1 shows that the average household family size for those who practice LIOAI is 9.01 with standard deviation (SD) of 3.05. On the other hand, the average household family size for those who didn't practice LIOAI is 9.03 with SD of 3.1. The result is almost similar even the family size that utilizes somehow greater than the family that uses organic input. This indicated that activities that need more resources or labor could not be a problem as the family big in size and no difference across non-practicing and practicing households. Thus, activities can be divided to the family and implemented within a short period of time. Even when we do different activities to introduce those activities for non-practicing community, labor intensiveness will not be an issue as the have good family number which means it will give good answer for the question that will be raised by the non-practicing team. For instance, they can easily transport. Labor use on organic farming is expected to be different from that of conventional farms (1-3). Organic farming is frequently associated with claims of high labor

requirements because it needs more resources than conventional farms for different activities (Stefano et al., 2018). The members of the household could be relatives living within the household for an extended period.

Labor is one of the main resources available to farmers. All activities performed by farmers, agriculture and other activities require labor as an input. Lack of labor is often mentioned as one of the limitations of realizing the use of organic inputs (Senait, 2002). Analyzing the availability and demand for family labor in various fields such as farm, off-farm, household, marketing activities and other external demands, including social duties and obligations that farmers' unions impose on families. It's too important. Sanait, 2002).

Table 4.1: Background characteristics of respondents

Variables	Organic (N=95)		Inorganic (N=43)		Total (N=138)		t-test	P-value
	Mean	SD	Mean	SD	Mean	SD		
Age								
Age	43.81	10.8	44.5	9.3	44.28986	10.4	0.3616	0.7182
Educational status								

Item	Responses	Organic (N=95)		Inorganic (N=43)		Total (N=138)		Chi-square Value
		Freq.	%	Freq.	%	Freq.	%	
Education Status	Illiterate	11	11.6%	3	7.0%	14	10%	0.03
	Reading and writing	22	23.2%	10	23.3%	32	23%	
	elementary (1-6);	32	33.7%	17	39.5%	49	36%	
	Junior (7-8)	24	25.3%	11	25.6%	35	25%	
	High school (9-12)	6	6.3%	2	4.7%	8	6%	

Household family member								
Variables	Organic (N=95)		Inorganic (N=43)		Total (N=138)		t-test	P-value
	Mean	SD	Mean	SD	Mean	SD		
Family Size	9.01	3.05	9.09	3.05	9.03	3.1	0.1464 0.5581	

Source:-Author's Field survey May, 2022)

4.1.4 Livestock holdings and production

As shown from the table 4.2 all of the respondent who practices LIOAI and 95.3% of the respondents who didn't practices LIOAI own livestock in their home. As a result of this, they could not face any problem to prepare organic inputs as most of organic inputs are derived from animal wastes. Without any cost they can prepare organic inputs simply using locally available materials. This indicated that they do not have any problem preparing organic fertilizer as the animals' waste can be used as a source of input to produce locally improved organic inputs. This reduces the production cost as they can easily get their compounds. In addition to this they could also reduce and mitigate many environmental impacts that can be caused by animal wastes when it treated as a waste (Udhaya and Suganthi (2018). Indirectly this can reduce the environmental pollution which has better contribution for sustainable development when is not polluted.

In relation to organic inputs used for crop production as confirmed through FGDs, livestock holding is one of the indicators of wealth status of the households in the study area. The FGDs revealed that livestock is kept both for generating income and traction power. Oxen provides draft power for crop production; and pack animals used for transporting inputs and outputs. Moreover, animal dung is used as fertilizer for crop production. Goats and sheep are kept solving liquidity constraints of the households. The livestock species found in the study area are cattle, goat, sheep, and donkeys.

According to Udhaya and Suganthi (2018) integrated crop-livestock is advocated to be very promising in boosting productivity and soil fertility owing to its numerous synergetic benefits. Mixed farming involves crops and livestock integration. Integrating livestock components into crops is one of the principles of organic farming. Having livestock together with crop production could improve quality and timeliness of framing operations as they could provide manure and prepare other inputs to improve soil fertility and to prepare solution that helps for crop protection purpose as integrated pest management.

4.2 Practice of LIOAI for sustainable crop production

According to KIIs, Assosso zuriya woreda dwellers main economic activity is farming. The major crops are maize, sorghum, soybeans and some other cereal crops which use the crop as the main staple food crop. Our survey also showed that from those study participants who practices LIOAI, 89.5% grow vegetables, 98.9% cereals and 72.6% fruit in their backyards and large farm

production area by using organic and inorganic input to increase production productivity (Table 4.2). However, many factors such as inappropriate crop rotation, unreliable rainfall, insect-pests attacks and diseases incidence limit their production. Apart from those factors, low soil fertility and acidity problems and crop pest disease infestations are major constraints that challenge the production in woreda. Improving soil fertility status is therefore very important in order to increase production sustainably.

Table 4.2: live stock production and practice of LIOAI

Item	Responses	Organic (N=95)		Inorganic (N=43)		Total (N=138)		Chi-square
		Freq.	%	Freq.	%	Freq.	%	Value
Livestock production								
Own Livestock	Yes	95	100.0%	41	95.3%	136	99%	0.034
	No	0	0.0%	2	4.7%	2	1%	
Practice of utilizing LIOAI								
Item	Responses	Organic (N=95)		Inorganic (N=43)		Total (N=138)		Chi-square
		Freq.	%	Freq.	%	Freq.	%	Value
Growing fruit	Yes	85	89.5%	38	88.4%	123	89%	0.529
	No	10	10.5%	5	11.6%	15	11%	
Growing Cereal	Yes	94	98.9%	43	100.0%	137	99%	0.688
	No	1	1.1%	0	0.0%	1	1%	
Growing Fruit	Yes	69	72.6%	29	67.4%	98	71%	0.301
	No	25	26.3%	14	32.6%	39	28%	

Source:-Author's Field survey (May, 2022)

FGD with the selected groups showed that farmers that live in the woreda grow crops like cereal, vegetables and fruit by using organic and inorganic inputs for the purpose of soil fertility enhancement and crop protection. The participants of the focus group discussion explained that utilization of locally improved agricultural input in the context of their area needs the involvement of experts from the extension services. The participants of this focus group pointed out that:-

Even though the utilization of locally improved organic agricultural input started but still it is not linked with the extension service. According to the participants there is a major challenge in production and productivity activities so far. These problems are soil infertility and crop protection problems, and the problem is increasing from time to time rather than decreasing. This leads the community for suffering on decrement of production and productivity and getting low income to support their family. Starting from the past three years the farmer's started producing and utilizing organic inputs (vermi compost, compost, organic liquid fertilizer and bio pesticide).

The FGD result indicates that organic input utilization practiced in Assosa zuriya woreda is easy, effective, and environmentally friendly. This shows that the practice of utilizing locally improved agricultural inputs is feasible with low production cost. The sustainability of crop production depends on input utilization and management practices during production period. Data regarding the practice of locally improved agricultural input utilization collected from the sample households, participants of focus group discussion and key informant interview confirmed this. In addition to that it created a better room to understand the role of utilizing locally improved organic inputs for sustainable crop production as it could bring considerable change of production.

The main activities practiced regarding utilizing of organic input is the study area are preparation and utilization of vermi compost, conventional compost, organic liquid fertilizer and bio pesticide which is prepared simply from locally available cost-effective material. Moreover, implementation of cultural practices and traditional knowledge are also practiced there. These all are practiced in the study area.

4.3 Organic Input Utilization and Agricultural Production and Productivity

The surveyed households grow vegetables and fruits in their backyards and large farm production area in addition to cereals. They grow these crops by using organic and inorganic inputs. The utilization of organic agricultural inputs in the study area is assessed from the sample households through survey questionnaire illustrated in table 8. As indicated in table 4.3, majority (68.8%) of the surveyed households started using locally improved agricultural inputs while 31.2% do not started the use. The one which used inorganic inputs (chemical fertilizer), they

mostly get the inputs from the cooperatives and sometimes from unions, but the organic inputs user produced by their own.

The sample households surveyed engaged in growing/cultivating of different crops like cereals, vegetables, and fruit trees by using agricultural inputs. According to FGDs and KIIs, some of them use only inorganic input and other uses both in combination to increase their production and productivity. This indicated that utilizing organic agricultural input is practiced more in the study area. The key informant interviewed experts and found out that the dwellers that live in the study area got better understanding about it and started practicing more as they are benefited. Similarly, the focus group discussion revealed that after three years because of different capacity building training courses, exchange visits and learning from farmers the practice of utilizing locally improved organic agricultural input increased. These capacity building trainings and exchange visits were prepared by NGOs for the selected target beneficiaries.

4.4 Types/kind of locally improved organic agricultural inputs

According to FGDs and KIIs, in the study area organic inputs are derived from the processing of plant and animal products that the farmer brings to his crop for it to express its production potential (they can be included as biological inputs). The most accepted organic inputs are manure, slurry and green compost. Agriculture is one of the main livelihood options that play a great role for income/economic source of the community. So, to have better economy/income the production and productivity must increase with low production cost because when the production cost decreases the income increases as they are inversely proportional (Marasteanu et al., 2018). Within the study area, the rural livelihood is dependent in farming practices thus cultivation of crops is common. The qualitative data indicated that the farmers of the study area are suffering from production declining due to different reasons like soil infertility disease infestation problem. To solve these problems, they have been using inorganic inputs which have high cost. This increase their production cost but as the household survey, KII and FDG indicated that when they started using of locally improved organic agricultural input their production cost decrease because most of the organic inputs are found in their compounds and can prepare easily. Not getting timely the agricultural input is also another reason for declining of production and productivity. As surveyed from the household respondents the inorganic inputs are getting from

the cooperatives and they are not getting on time as needed. Even though there is price unaffordability.

The survey indicated that the farmers who practice the utilization of organic agricultural input can get an immediate solution for the problem observed during production time as they are producing them by their own using locally available cost-effective material. The contribution of organic inputs is an important agro ecological lever to preserve the agricultural soil quality.

4.5 Source and production of agricultural input availability

By decomposing and fermenting, organic materials from the farm or outside allow organic inputs to form. Plants inputs are derived from plant decomposition, they include compost, pruning residues, organic preparations, household wastes chipped wood etc. The biomass availability found in the small household includes animal feed left over, manure, and household waste and animal urine. Accordingly, almost all the respondents have this biomass in their home (table 4.3).

Table 4.3: input utilized and biomass availability.

Input utilized			
S.N	Input utilized	Frequency	Percent
1	Organic agricultural input	95	68.8
2	Inorganic agricultural input	43	31.2
	Total	138	
Biomass availability			
	Types of biomasses	Number of respondents	Availability percentage
1	Animal feed left over	138	100%
2	Manure	138	100%

3	Household waste	138	89.1%
4	Animal urine	138	71.7%

Source:-Author's Field survey (May, 2022)

As indicated in the above table, the availability of biomass in the surveyed household is good. This makes the practice of utilizing organic input utilization easy because they can simply prepare the input by using the available material. Moreover, FGD respondents indicated that farmers are willing to prepare the organic fertilizer as it decreases the production cost and indirectly cleans their environment from waste.

The main organic fertilizers came from peat, animal and vegetable manures from agriculture and sewage sludge (Kostandini et al., 2011). Natural organic fertilizers include animal waste, peat and slurry from meat processing. Organic farming has a positive impact on the environment and food quality, and also helps farmers to become self-sufficient in the necessary agricultural inputs and reduce costs. The goal of organic farming is a combination of organic, environmental, social and ethical goals.

4.6 Adoption of Locally Improved Inputs Utilization

Organic inputs such as different types of composts, biofertilizers etc. are important not only in organic farming but also of paramount importance in integrated farming with balanced use of fertilizers to maintain soil fertility to promote the use of such environmentally friendly technologies and inputs.

4.6.1. Benefits of organic agricultural input

According to the respondents of household survey, FGD and KII the activities implemented on the use of organic agricultural inputs are highly adopted in the study area. They prefer to use locally improved agricultural inputs instead of inorganic inputs. This is due to its advantages i.e. its effectiveness and cost effectiveness, immediate solution, availability, no negative impact on human and environment and ease of implementation by any member of the family. This shows that the concept of using improved agricultural inputs has been adopted locally in the area.

In addition, the participants in the focus group discussions confirmed that farmers are familiar with and like the implementation practices because of its usefulness and ease of preparation.

In this context, research has shown that organic fertilizers differ from chemical fertilizers because their ingredients are plant, animal or mineral by-products (Gelgo et al., 2017). Decomposers from these sources naturally degrade and supply the soil with nutrients and minerals. Nutrients are available in regular soil, but fertilizers can provide balanced sources of nutrients to plants and ensure that they get the right amount. Proper lawn care includes keeping your lawn and garden healthy. One of the advantages of organic fertilizers was that the nutrients were incorporated more slowly than chemical fertilizers. This slow process allows plants to process the fertilizer in a more natural way, without excess fertilizer that can harm the plants (Gelgo et al., 2017). Soil drainage and soil air circulation can also be improved. Starting a compost pile was also a great way to help take care of the lawn and the environment while eliminating food waste. It was an important and valuable option to help maintain the health of the soil and environment and produce the best plants.

4.6.2 Knowledge of the community about utilization of organic agricultural input

The community participation in implementing the utilization of locally improved organic agricultural input increased from time to time as they are befitted more. The implementation practice must expand. In the other hand as informed from the household survey, FGD and KII they could easily understand the concept of utilizing organic agricultural inputs and all the respondents pointed out it performs well than the inorganic one. As mentioned before the study area is suffering from soil acidity problems and pest and disease infestation especially on vegetable and cereal crops like maize. Though the application of the prepared organic input could minimize their production problem and produce more yield than before.

4.6.3 Implementation of agricultural input

As surveyed about 5.4 % of the respondents started using locally improved agricultural inputs before 3 years ago, about 29.7% started using before 2 years and 15.9% of the household started

using before one year ago. This indicated that the adaptation of utilization of organic input has been expanding in the study area.

Table 4.4: Years of utilizing organic input.

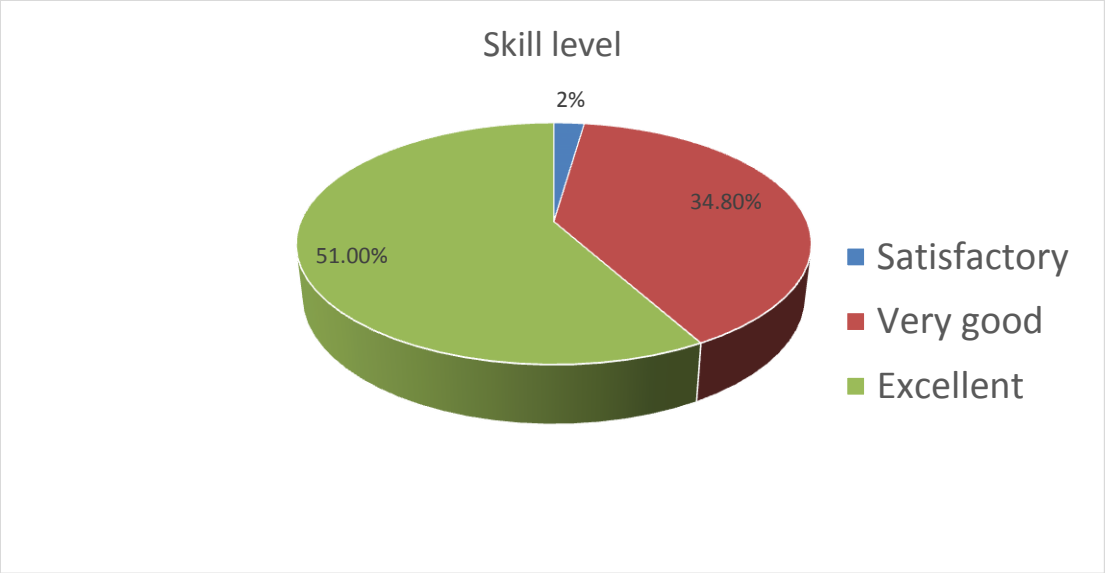
Years	Frequency	Percent
0	39	28.3
1	22	15.9
2	41	29.7
3	35	25.4
6	1	7
Total	138	100.0

Source:-Author's Field survey (May, 2022)

4.6.4. Implementation strategy to increase the utilization of organic agricultural input.

As testified through the qualitative and quantitative data (Figure 4), currently in the study area utilizing of locally improved organic agriculture is expanding from time to time from small group to the community and from woreda to woreda because of the positive observed results. Expanding the implementation can solve the problem sustainably, therefore expanding the concept of utilizing organic input needs the implementation strategy. In the other hand with less expansion and sharing of implementation the problem of decreasing productivity with highly production cost will continue and negatively impacted the community livelihood as indicated from respondents surveyed household.

According to the respondents of the survey questionnaire, FDG and KII, they are happy with the knowledge of utilizing LIOAI and thought that they have well enough knowledge that can be share for others. So that they planned to share and expand the utilization of LIOAI through actively participating and organizing practical trainings, exchange visits field days and experience sharing program.



As shown in the pie chart, the respondents of the surveyed sample household knowledge status vary from satisfactory (2%) to very good (34.8%) and excellent (51.0%) level. This indicated that the concept of utilizing organic agricultural input internalized and understood in a very well manner so that they can share easily to the others and expand the implementation so as to attain sustainable crop production.

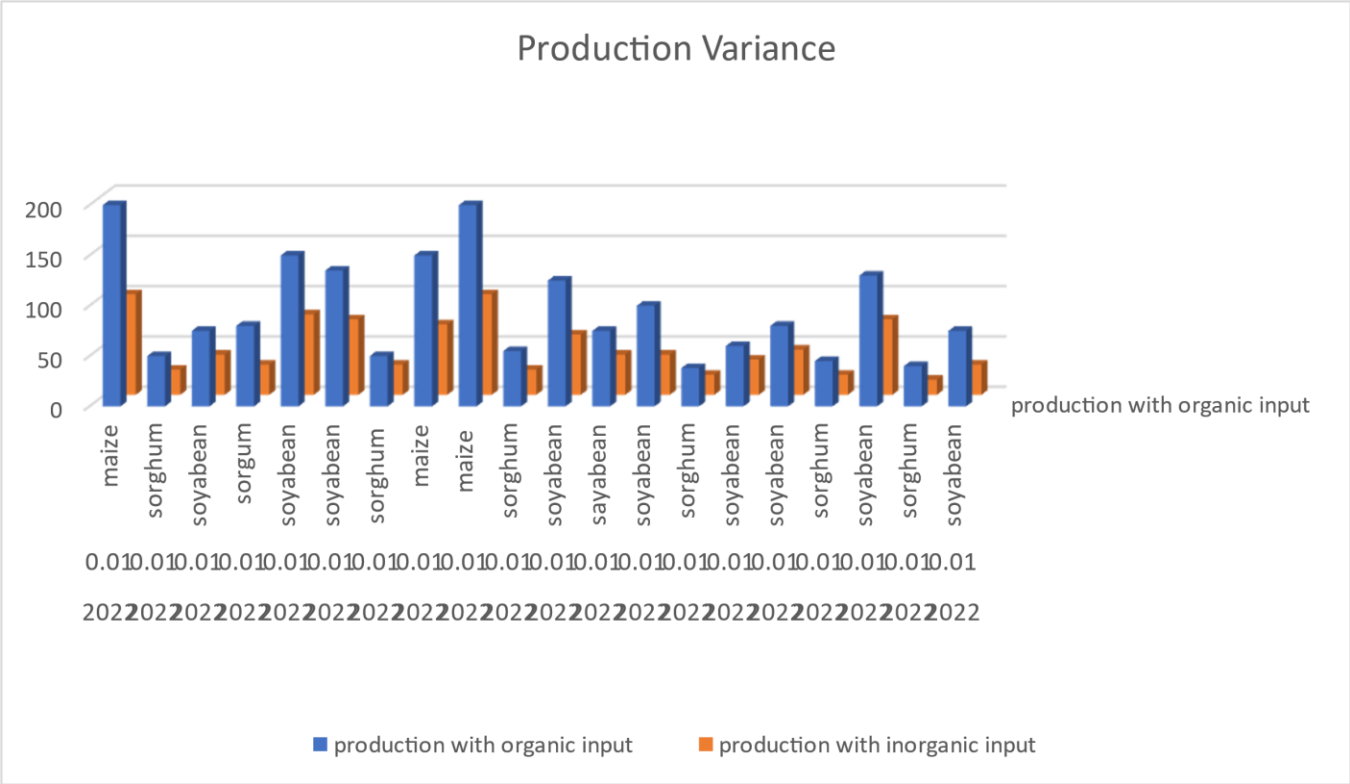
Figure 4.1: Experience sharing and exchange visit.

4.7 Role of locally improved organic input utilization for sustainable crop production

4.7.1 Economic benefit

As per the data obtained from the household survey, Focus group discussion and key informative interview. After the community that started using organic input can see significant change in

their production that they obtained sofa. The used o grows soybean, maize and sorghum with the same replication except soil fertility input utilization. as observed in the below chart in maize crop they could get production two folds. As per the respondents and FGD this result helped them to increase their income with low production cost as costs related to purchasing of inorganic input decreased and also the quality of the product increase with quantity as a result they could cell it with better price.



4.7.2 Major socio-economic challenges

The responses of the surveyed households illustrate focus group discussion and key informant interview revealed that the study area community experiencing various socioeconomic challenges. As known, most of the dwellers that live in the woreda their income source dependent on agriculture, however the sector is facing various challenges such as low input utilization, limited access to credit to buy agricultural inputs, soil fertility and soil acidity problems. They are supporting their family livelihood by the income getting from the sector but as the production has been decreasing through time.

Figure 4.2: Soya beans growing with organic input.

Declining soil fertility is a critical development challenge for sustainable crop, livestock and forestry production in Ethiopian agriculture. Land degradation and declining soil fertility have been recognized as major biophysical causes of declining per capita food production in Ethiopia. Damage to the soil's carrying capacity due to artificial chemical inputs directly affects the food and food supply. Soil productivity is reduced by the use of chemical inputs, increasing the inefficiency of soil management. However, it can be minimized by using organic fertilizers from feces and urine (Bahir et al. 2019). Finally, although agriculture dominates the Ethiopian economy (Mitiku et al., 2022), about 44% of the population is malnourished and 47% of children suffer from malnutrition (FAO, 2014).

4.7.3 Problems observed during production and productivity.

As described in table 11, the major problem farmers were facing in their production activity is soil infertility and crop pest and disease problem. The Assosa zuriya woreda soil type is reddish and have strong acidity problem, where the problem has been increasing from time to time and make the soil infertile. In addition to that, they are producing maize as their main staple food but still they are facing disease problems. As a result of this, farmers are losing production. According to them so far, they were using inorganic inputs to solve the problem by buying with high cost but rather than solving the infestation problem increased and could not control it as it develops adaptation. Because of this the production cost increases with low output. Chemical fertilizer feed the plant rather than nourishing the soil, so it gives temporary solution not for long run.

Table 4.5: Major problem of production

	Major problem	Respondents	Percentage
1	Soil infertility	138	100%
2	Crop pest and disease	138	100%

Source:-Author's Field survey (May, 2022).

4.7.4 Causes for the observed problem.

As the FDG and KI pointed out that soil infertility problems and disease and pest disease observed more in the woreda. As they indicated that this problem could be observed because of frequent farming and repeatedly utilizing inorganic input fertilizers. Both are mandatory for them, to live their lives they must grow different crops and to get better production they have to use inputs. These inputs are costly, and the usage amounts increase from time to time. This leads them to invest more in production costs with low output.

From their experience, they suggested that integrated nutrient management is an alternative and is characterized using inorganic fertilizers in combination with animal manure, plant residues, green manure and compost to reduce the number of inorganic fertilizers and control the problem.

4.7.5 Role of utilizing locally improved agricultural input

As per the household respondents and FGD the study revealed that utilizing of locally improved organic agriculture inputs can solve their problem related with soil and crop protection sustainable by the way it also protected their crops from the damage of animal. According to them, when they start using LIOAI, they could overcome the problem observed in the study area. This result could also attract Assosa agricultural research center and Assosa University. Organic input utilization could maintain the soil acidity problem and increase their production by two folds. In addition to that the fertilize consumption decrease and the plant develop disease resistance and drought resistance ability as it nourishes in a good way which means the amount

of fertilizer used by the first production period decreased for the next production/ growing season. This indicated that the applied organic input could maintain the soil texture, moisture holding capacity, microbial movement in the soil, soil structure and increase the organic matter content.

Organic fertilizers have a positive effect on agricultural productivity and are a solution to overcome the poor soil conditions in the study area. It is one of the agricultural technologies that are considered to reduce direct production costs, increase environmental benefits and increase crop yields (Agboola, 1982). However, smallholder farmers' habit of using organic fertilizers in Ethiopia is low and extension services providing technical advice are insufficient or inadequate.

In the other hand problem regarding with pest and complaint infestation also managed by the produced memoir fungicide because first the shops develop complaint resistance capability and second of all the produced result can control the conditions better than the inorganic bone and the special thing is it does not have any adaption problem.

As informed by surveyed community, they simply apply the result as a precautionary measure with nonstop operation with 2- 3 weeks interval. Due to this they could get good quality and volume products with low product cost and with no negative impact on mortal and terrain as environmental pollution dropped that cause by applying of inorganic toxin to the soil and the air during spraying of chemical. In addition to that these organic agrarian inputs could give them an immediate result for the problem regarding major challenges observed in the sector.

According to them they could control the problem before it's getting Sevier as they aren't anticipated to take time to get inputs from outdoors because they could simply prepare it by their own. So that the study revealed that exercising LIOAI can break the problem sustainably with lower negative impact on terrain and mortal health. Laterally this reduces environmental decline that can beget by pollution. As we know environmental decline is one of the major problem that could affect in achieving sustainable development.

As mentioned earlier, agricultural development mainly determines the country's economic growth rate. Therefore, it is necessary to look for new ways or means to increase the production of existing agricultural land, because increasing productivity helps a lot in increasing the income of farmers. The main factors contributing to the poor performance of Ethiopian agriculture come from several natural environmental deficiencies and several human-caused factors.

Table 4.6: result obtained by utilizing organic Input.

S.N	result obtained by utilizing organic input	Number of respondents	Percentage
1	Soil fertility improvement	103	74.6
2	Utilization inorganic input decreased	103	74.6
3	Soil water holding capacity increased	103	74.6
4	Production cost decreased	103	70.3

Source:- Author's field survey (May, 2022)

As shown in the above table 12 the farmers that utilized could benefit more. Soil fertility improvement, water holding capacity and decrement in utilizing of inorganic inputs improve by 74.6% and the production cost decreased by 70.3%. This indicated that better improvement is observed in the study area by utilizing locally improved organic agricultural input.

Figure 4.3: crops growing with inorganic and organic input.

The above picture could clearly show the difference between utilizing organic and inorganic input. The sorghum that grows using inorganic input is, the stem is very thin, do not hold much yield and also do not have much leave on it. In the contrary when you look the sorghum growing with organic input has better vigorousity it holds much yield and has dark green and healthy leaves. Pictures can talk more than words.

CHAPTER FIVE

CONCLUSION AND RECOMMENDATION

5.1 Conclusion

The research finding revealed that the livelihoods communities that live in that area are relied in agricultural production and they grow crops, vegetables, and fruit. During production time they are suffering from soil infertility and crop pest and disease problem. As a result of this their productivity decreases from time to time. As surveyed after the introduction of the practice through local NGO, from the survey household 68.8% are started utilizing this organic input. As per the indication of the FGD, KII interview and household survey the communities that started utilizing of this local organic input could get somehow relief from the problem that they suffered so far.

The research findings indicated that all the surveyed households engaged in livestock production, and this makes the availability of the biomass high because of this shortage for inputs will not be an issue to produce organic input. Moreover, the number of the household family and education level of the surveyed household from both (practicing and non-practicing) is good because of this introducing these practices further will not be difficult.

Utilization of organic agriculture input is important and help to assume sustainable crop production in the area because as known the woreda is suffering from declining of crop production and the communities are mainly dependent on agriculture as economic source. The land is degraded, and the soil fertility problem is the main reason for the decrement of production. As obtained from the household survey, they could minimize the problem that they suffer so far and produce more products than before. In addition to that which implemented utilization of locally organic inputs could solve the problem related to production cost loss as compared to the others that use inorganic inputs. Mainly they are used as an organic input like vermi compost, compost, liquid fertilizer, and manure.

As the result obtained from the FGD, KII and household survey in a very short period the introduced community started practicing it in a good manner and they could easily adapt the concept as a result of this around 51% of the surveyed household have an excellent skill of

implementing this introduced practice and also 34.8% are in a very good knowledge skill level. This is a good indicator for internalizing the introduced practice.

Even if they have a know-how or awareness about the utilization of locally available improved organic inputs there should be more capacity building program to capacitate the communities more. The study revealed that some of the communities that implemented the utilization of local improved organic agricultural inputs could get better production than before and the production has better yield in than before. Beyond increasing the production and they could increase also their income and decrease the production cost because they can produce more with quality and quantity by this, they can get good price and also the amount of purchasing chemical insecticide decreased which is costly. They tried to manage the soil infertility problem by adding organic fertilizer like bio slurry, vermi compost and conventional compost.

The study indicated that after the community started utilizing this organic input, the soil fertility improved, utilization of inorganic input decreased, the soil water holding capacity increase and these all have a positive contribution for decrement of production cost. If the soil is healthy, the plant becomes healthier and more resistant to different diseases, drought and moisture stress problem as the water holding capacity of the soil increases. This is also a good indicative of nourishing the soil rather than the plant. The amount of fertilizer utilization for production decreases from time to time which means the organic input utilized helps to maintain soil fertility and started to get back its natural behavior. If the utilization of organic agricultural inputs expanded, the smallholder farmers living in the woreda could become more productive with less production cost and safe environment and human health.

In addition to as per the respondents organic input utilization gave them immediate solution for the problem observed especially diseases infestation until they get better treatment. This can be affected by availability, its cost etc. This will lead to more infestation. But this input could give relief or breathing space until to get a solution. Even currently the country is facing problems in getting urea and dap for this growing season because of they are moving to address the problem by introducing the utilization of compost through capacity building program jointly with private sector and NGOs. As a result of this woreda agricultural office is also playing an important role in creating awareness on utilization of agricultural.

Therefore, by recognizing its benefits and role in ensuring sustainable development utilization of organic agriculture must get attention by the ministry and include on the extension package services.

5.2 Recommendation

On the basis of the findings study, the following recommendations are forwarded for enhancement of production and productivity in the regions.

- The community who utilized locally organic inputs underlined that the practice could solve the problem related to production cost as compared to use of chemical fertilizer beyond sustainable production increases, therefore, the practices need to be included in the regular agricultural extension program and promoted.
- As indicated in the study creating a better understanding in production, utilization and importance of locally improved agricultural organic inputs is a must so that awareness raising program through focused practical must be organized to internalize the concept.
- Ministry of agriculture must give more attention in introducing utilization of organic agricultural inputs together with non-governmental organization because of this more efforts must be exerted to wide technologies related with organic inputs through adopting new technologies (vermi compost, bio slurry, conventional compost etc.) and gathering indigenous knowledge.
- Increasing utilization of organic agricultural inputs in the woreda is not optional rather demanded therefore joint action among government, private sector and NGO is needed. This will include doing research, monetary and in-kind support, providing training etc.
- Scale out the utilization of organic input practice in other woreda of the regions is necessary because of this promotional activity by using different mechanisms (social media, Radio, Tv, flyer etc), lobbying advocacy strategies and organizing national workshops by inviting relevant stakeholders, influential people and policy makers through using the testimonies of the practitioner have to organized.
- Organizing capacity development is vital to increase the engagement and cooperation of extension worker with non-governmental organization in cascading the practice.

- Organizing field day field visit and experience sharing is a key indicator in expanding and escalating of the practice.

5.2.1 Recommendation for further research

Since agriculture in Ethiopia needs food security as well as food safety with rich nourishment of the soil to get increased productivity, profitability, and sustainability. In achieving this goal tremendous research activity is needed in identifying the ingredient or content of the organic inputs like soil fertility enhancement and crop protection solution to increase the utilization of organic input confidently. As we all know, the ingredients of organic input in related to macro and micronutrient is not known. So doing research in identifying the nutrient level of organic input is more helpful in utilizing with a very confident position through confirming cost effectiveness and environmentally friendly.

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Annexes

Annex 1

Survey questionnaire

SCHOOL OF GRADUATE STUDIES

COLLEGE OF DEVELOPMENTAL STUDIES

CENTER FOR ENVIRONMENT AND DEVELOPMENT STUDIES

Dear respondents,

I am Netsanet Genene students of Addis Ababa University. I prepared this questionnaire to collect data for Master thesis research purposes which is titled as "The role of locally improved organic agricultural inputs utilization for sustainable crop production in Benishangul Gumuz".

This research is intended for academic purpose authorized by Addis Ababa University. Thus, your ideas and suggestions are highly honored and kept confidential. Your honest responses to the questions have higher value for the success of the research. Therefore, I cordially ask you to respond to the questions, but if you have any issue you can ask for clarification or withdraw at any time.

Thank you in advance for your cooperation and understanding.

Address: - Email: lilaiesweet@gmail.com

Mobile Phone: 0911791093

Part I

Demographic data

1. Respondent Name: _____
2. Kebele_____;
3. Age of respondent _____ Years
4. Educational Level:

   A) Illiterate B) Reading and writing; C) elementary (1-6); D) Junior (7-8); D) High school (9-12); E) Diploma and above

5. Family size: ____ number:

6. Family members Gender composition (number)

   6.1. Male _____ 6.2. Female _____

Economic activity

7. The type of economic activity your household engaged in:

   A) Farming; B. off farm activity; C. civil servant; D business/trading.

8. Do you have livestock?

   A) Yeas B) No

9. If your answer is yes, to the above question please complete the following table

	Livestock type	No owned	
1	Cows and heifer		
2	Ox and bull		
3	Calves		
4	Sheep including lambs		
5	Goat and kids		
6	Donkey		
7	Horse		
8	Mule		
10	Poultry		
11	Beehives (traditional and modern)		

Part II

The practice of locally improved organic agricultural inputs utilization for sustainable crop production among study area community

Production system and practices

10. What type of crops are you growing? (Multiple answers is possible)

    A) Fruit B) cereals C) vegetables

11. Where is your production area?

    A) at the backyard B) On a large farm

12. What agricultural inputs do you use to increase production and productivity?

    A) Organic agricultural inputs B) inorganic agricultural inputs

13. If you are using inorganic agricultural input, where do you get it from? (Multiple answer is possible)

    a. from the market B) cooperatives/unions

14. If you are using organic agricultural inputs, how do you start using of it? (Multiple answers possible)

    a. Learned from agriculture office of the government, mainly from DAs
    b. Introduced by non-governmental organizational C) From community traditional knowledge
    d. Learned from other farmers

15. What kind of organic agricultural inputs do you use? (Multiple answer possible)

    a. Manure B) compost C) liquid fertilizer d) bio pesticide

16. Where do you get these organic agricultural inputs? (Multiple answer possible)

    a, From the market B) own production C) from worda agricultural office

17. If you produce, what do you use as production inputs? (Multiple answers possible)

    a. Animal dung and urine B) agricultural and household waste materials C) plant debris

18. What kind of biomass is available in your home (multiple answers possible)?

A) Animal feed left-over B) Manure E) Household waste D) Animal Urine E). None of the above

19. Do your crop (, fruits, and vegetables) get affected by plant disease, pest and insects?

A) Yes B) no

20. If the problems exist, how do you prevent or reduce the disease, pest and insect (multiple answers possible)?

A) Use of industrial agro chemicals

B) Use of bio pesticides

C) Use of traditional practices

D) IPM (combination of organic and inorganic)

21. If you are applying agro-chemicals for crop protection, what kind of industrial agro-chemicals do you use? (Multiple answer is possible)

A) Fungicides B) pesticides C) insecticides D) herbicide

22. Is there any other option that you use for crop protection other than industrial agro-chemicals?

a. yes B) No

23. If you say yes to the above question, what are they? (Multiple answers possible)

a. Cultural practice B) bio pesticide C) traditional Knowledge

24. In which crop (fruit, cereal and vegetable) do you use organic agricultural inputs mostly? (Multiple answers possible)

A) Vegetables B) fruit C) cereal

PART III,

Adoption of locally improved inputs utilization in study area community

25. What do you like about the agricultural organic input (multiple answers possible)

    A) Its efficacy and cost effectiveness

    B) Availability (when needed)

    C) No negative impact on human and environment

    D) Easiness to implement by any one of the family

26. Is it A) easy to or B) difficult to implement utilization of agricultural organic input?
27. How well does organic agricultural inputs perform?

    A) Satisfactory B) good C) Very good D excellent

28. How would you rate your skill level with utilizing of these organic agricultural inputs?

    A) Satisfactory B) good C) Very good D excellent

29. Are you happy by using of this agricultural organic input?

    A) Yes B) No

30. How often do you use it? (If less than 1 year give the answer in decimal)

    _____

31. Do you have plan to expand the implementation

    A) Yes B) No

Part IV,

Role of locally improved organic input utilization for sustainable crop production

The main existing challenges

32. What are the major challenges observed to increase production and productivity in your area? (Multiple answers possible)

    A) Soil infertility problem B) crop pest and disease problem

33. What do you think the main cause of the problem related with soil infertility? (Multiple answer possible)

    a. acidity B) salinity C) Erosion D) degradation by repeated cultivation

34. What do you think is the reason for the existence of disease and pests? (Multiple answers possible)

    A) Utilization of inorganic input continuously B) adaptation of agro chemical

    c, less professional support

35. Which one (organic and inorganic) is more beneficial and cost effective to solve problems (soil infertility and pest and disease)?

    A) Organic input B) inorganic input

36. Do you get inorganic agricultural inputs immediately as needed and use the same amount of it from year to year?

    A) Yes B) no

37. For you which agricultural input is easy to get immediate solution for the problem related with soil infertility and crop protection? (Multiple answer possible)

    A, Organic input utilization B) inorganic input utilization

38. Have you ever noticed problems with utilization of inorganic inputs? (Multiple answer is possible)

    A) Soil infertility problem B) more disease infestation C) costly D) utilization increment from time-to-time D) not getting timely

39. What are the benefits you observed by utilizing organic inputs? (Multi answers possible)

    i. Soil fertility improvement sustainably B) utilization of chemical pesticide decreased C) soil water holding capacity increase D) Production cost decrease E) getting better yield.

40. What are the major socio-economic challenges? (Multiple answers possible)

    A) Decreasing of production, B) high production cost

Name of data collector_____ date of data collection_____

Annex 2

Checklist for focus group discussion

We are here to discuss the contribution of locally improved agricultural input utilization for sustainable crop production.

1. What are your thoughts about sustainable crop production and organic agricultural inputs utilization?
2. What is the most common problem in the agricultural sector in your area? From your own experience, how can be long lasting solutions found?
3. How can we get sustainable crop production sustainably?
4. What do you know about organic agricultural inputs?
5. How familiar are you in utilizing of these organic agricultural inputs?
6. What do you think the pros and cons in utilizing organic agricultural inputs?
7. What changes did you observe after you started using of organic agricultural inputs in your field and production?
8. According to you which one of the two (organic and inorganic) is best?
9. What is the reason you prompted to practice more utilizing of organic agricultural inputs?
10. What is your effort to expand the utilization of organic agricultural inputs for the other communities?
11. Is there anything other than the already discussed questions you would like to add or talk about sustainable production and organic agricultural inputs?

Annex 3

Check list for Key informant interview

1. Tell me about yourself and how long you've been working on organic farming with smallholder farmers in the woreda?
2. In every region of the country there are different kinds of problems related to production, what are the most critical problems in terms of increasing production and productivity in the community/area?
3. What methods are you using to manage the problems?
4. How do you promote utilizing of organic agricultural inputs and train the smallholder farmers about implementing of it?
5. Do you think communities that have begun to use organic agricultural inputs seem to have solved the observed problem better than using inorganic agricultural inputs? if so, what is your reason for saying that?
6. What challenges have you observed in implementing utilization of organic agricultural inputs?
7. Many Factors affect the sustainability of crop production and leads to production decrement. Given your experiences, which practice either utilization of organic or inorganic inputs, are contributing more in attaining better yield and sustainable crop production?
8. How would you measure the contribution of these practices for sustainable crop production?
9. What type of professional assistance/support is available to help the smallholder farmers to learn more about and internalize the concept of utilizing organic agricultural inputs?
10. What are you hoping will result from your participation in the implementation of utilizing organic agricultural input?
11. What would your stake to support practice and adoption of utilizing organic agricultural inputs widely?
12. From your own experience and knowledge, how can the observed problems can be solved in the long run?
13. Anything you want add about the interconnectedness of utilizing organic agricultural input and sustainable crop production?