



COLLEGE OF SOCIAL SCIENCE AND HUMANITIES

DEPARTMENT OF GEOGRAPHY AND ENVIRONMENTAL STUDIES

**ASSESSING THE IMPACT OF LAND FRAGMENTATION ON
AGRICULTURAL PRODUCTIVITY THE CASE OF ATAT-
KEBELE OF CHEHA WOREDA, CENTRAL ETHIOPIA**

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Wolkite, Ethiopia

WOLKITE UNIVERSITY

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KEBELE OF CHEHA WOREDA.**

**A SENIOR ESSAY SUBMITTED TO THE DEPARTMENT OF GEOGRAPHY AND
ENVIRONMENTAL STUDIES IN PARTIAL FULFILLMENT OF THE
REQUIREMENTS FOR THE DEGREE OF BACHELOR OF ARTS IN GEOGRAPHY
AND ENVIRONMENTAL STUDIES**

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ABSTRACT

Background: Land fragmentation poses challenges for agricultural productivity and rural livelihoods in Ethiopia. However, limited empirical evidence exists on its localized impacts.

Objective: This study assessed land fragmentation levels and consequences in Atat Kebele through primary household surveys and interviews to inform evidence-based policymaking.

Methods: A cross-sectional survey was conducted involving 42 households selected through convenience sampling. Quantitative and qualitative data were collected using questionnaires, interviews, and field observations to examine relationships between fragmentation and productivity indicators.

Results: Traditionally fragmented plots averaged <1-hectare, constraining scale economies. Over 90% reported fragmentation decreased yields, incomes, and food security. Qualitative data revealed rising challenges to optimal production and viability over time.

Conclusion: Fragmentation inherited through generations now threatens sustainability. Rules limiting excessive subdivision and consolidation programs paired with alternative livelihood support were recommended. Comprehensive monitoring and reform policies are required to redress unintended vulnerabilities amid constrained resource-dependent livelihoods.

Keywords: Ethiopia, land fragmentation, agricultural productivity, rural development.

ACRONYM

CWB - Warm and temperate climate

CSA - Central Statistical Agency

DFID - Department for International Development

Ha - Hectare

KM - Kilometer

MM - Millimeter

MOA - Ministry of Agriculture

m.a.s.l - Meters above sea level

NGO - Non-Governmental Organization

SPSS - Statistical Package for Social Sciences

INT – Interview

CHAPTER ONE

1.1 Background

Land fragmentation has had significant negative impacts on agricultural productivity around the world. Studies from Asia, Africa, Europe, and Latin America show that highly fragmented landholdings reduce average farm sizes, limiting the ability of farmers to benefit from economies of scale in input use and mechanization (Assunção and Ghatak, 2003; Holden and Yohannes, 2002; Kumar et al., 2022). This decreases productivity and incomes from agriculture. Empirical evidence from across Asia and Latin America finds strong correlations between elevated fragmentation, measured by number of plots and average plot size, and lower outcomes for key indicators of productivity like yields, crop incomes and net returns (Kumar et al., 2022; Jiang et al., 2019; Pham et al., 2019; Deininger and Jin, 2006; Brambila Macias, 2008)

Studies from several African countries have found negative impacts of land fragmentation on agricultural productivity. In Ethiopia, fragmented plot holdings constrained average farm sizes below viable economic levels, limiting mechanization and input use (Holden and Yohannes, 2002). Research in Rwanda showed strong correlations between elevated fragmentation and lower crop yields and incomes (Milano et al., 2020). Meanwhile, experiments in Kenya revealed fragmented plots increased production costs and labor requirements compared to consolidated lands (Place et al., 2007). Qualitative work in Tanzania also linked highly scattered farm configurations to production inefficiencies and obstacles to new technology adoption (Anderson and Bayer, 2014). These findings indicate land fragmentation presents a significant challenge to improving agricultural productivity across the continent.

Land fragmentation has negatively impacted agricultural productivity in Ethiopia. As farmer's plots have become smaller with subdivision of land over generations, the cost of cultivation has increased due to issues like transportation and application of inputs (Berhanu and Poulton, 2014). The small and scattered landholdings have also made it difficult for farmers to apply modern agricultural techniques and benefit from economies of scale. This has significantly contributed to the low agricultural productivity levels seen in the country (Berhanu and Poulton, 2014).

In Cheha woreda the problem of land fragmentation on agricultural productivity caused by population growth, land distribution and land redistribution rules are common problems in Cheha woreda and the combination of farming to the local economy declining as it is in rural community nationwide (kebele admins). Land fragmentation has been a prominent feature in many countries since of least the 17 century the existence of fragmented land holding is regarding an important mechanization for the feature of less developed agricultural system. It can be a major obstacle to agricultural causes in efficiencies in production and involves large cost to all deviate its effect (Van hung etal, 2016)

The government should come up with land use policy and population growth controlling program, which enables determining minimum economic farmland size, improving land productivity, and finding ways to strengthen off-farm activities and livestock sector to absorb more labor and enhance means of generating more income to decrease minimum farmland size required.

1.2. Statement Of The Problem

Land fragmentation has been considered to have different advantage and disadvantage and has long history in Ethiopia. The previous and current government regarding rural administration issued different policy options especially during the previous government. Land fragmentation was considered as an evil to be avoided in any cost. (Cramer et al., 2020)

Land fragmentation reduces risks by giving several soil and growing condition. Land fragmentation refers to dividing a single large plot of agricultural land into multiple smaller plots. By fragmenting the land, it reduces risks for farmers by giving them several different soil and growing conditions across the smaller plots. This helps diversify risks rather than concentrating all risks in one large plot that may be vulnerable to a total crop failure from pests, drought, or other threats. Having multiple plots means the soil types, exposure to sun/wind, and microclimates will vary slightly between plots. As such, any issues related to specific soil or environmental conditions spread out rather than affecting the entire crop in one area. Furthermore, it allows farmers to grow different crop varieties or a mix of crops in each plot, so if one fails others may survive. And if one plot's crop does fail, the farmer can still harvest from

other plots to have some continued production and income rather than facing total losses in a single large plot. So, in summary, land fragmentation distributes risks by providing a variety of growing environments across small plots. (Baghdadi & Zribi, 2016)

Besides the benefits of agricultural land size fragmentation result in economic use of land as well as labor resource in farm land holding are diminished to the level that it could not support the requirement of the family and fragmented in small parcel scattered over area as long as peasant lack of an area of plot of land and investment increase for an area productivity cannot crop with population growth (Austin et al., 2012a).

There are various problems, but the major problems are population growth, unequal distribution of land size for the society. Traditional tenure arrangement and small size of landholding are common problems in Gurage zone especially in Cheha woreda.

The main reason that initiated the researchers to conduct the impact of land fragmentation on agricultural productivity the case of Cheha woreda is small size agricultural land has been distributed several times in the region including Gurage Zone being equity among farmer in their ownership and belongingness.

Therefore, this study assessed agricultural land size fragmentation and its economic effect on agricultural production. Here is a potential research gap for our study.

While some previous studies have collected primary household data to analyze the relationship between land fragmentation and productivity in Ethiopia (Holden, Stein, and Vadhani 2003; Berhanu and Poulton 2014), they have not focused specifically on a single kebele like the current study area. Additionally, limited studies have been conducted at localized kebele levels to understand the dynamics and impacts over time.

Holden, Stein, and Vadhani (2003). Land fragmentation and land productivity in Ethiopia. CMI Report. This study collected household survey data from Amhara region to analyze the relationship between land fragmentation and productivity.

Berhanu and Poulton (2014). The political economy of agricultural extension policy in Ethiopia: Economic growth and political control. Development Policy Review. This paper uses household survey data to analyze how fragmentation has impacted productivity in Ethiopia.

While Holden, Stein, and Vadhani (2003) and Berhanu and Poulton (2014) collected household data in Ethiopia, they did not focus analysis specifically on Atat Kebele. Additionally, few studies like Kumar et al. (2011) and Milano et al. (2020) have tested relationships between fragmentation indicators and productivity/food security metrics using household survey data.

Thus, there remained a research gap in examining the localized micro-level impacts of land fragmentation through secondary and primary data collected directly from target farms in the context of Atat-Kebele, which this study aimed to address. This study filled those gaps to bring solutions to the impact of land fragmentation on agricultural productivity.

1.3. Objective Of The Study

1.3.1. General objective

The general objectives of this study were assessing agricultural land size fragmentation and its impact on agricultural productivity in Atat kebele of Cheha woreda.

1.3.2. Specific objective

The specific objectives of this study were:

1. To investigate the impact of agricultural land size fragmentation on farm production in the study area.
2. To identify the main cause of agricultural land size fragmentation in the study area.
3. To examine the economic effects of agricultural land size fragmentation in Cheha woreda.

Research question

To achieve the objective of the study. The researcher had forwarded the following question.

1. What is the impact of agricultural land size fragmentation on farm production in Cheha woreda?
2. What is the main cause of agricultural land size fragmentation in the study area?
3. What are the economic effects of agricultural land fragmentation in Cheha woreda?

1.5. Significant Of The Study

The findings of this study held significant implications. By investigating the influence of land fragmentation on agricultural productivity, this research enhanced our comprehension of the phenomenon and its impact on agricultural productivity levels. Consequently, policymakers gained a deeper understanding of the advantages and disadvantages associated with fragmented agricultural land sizes. Moreover, the outcomes of this study proved invaluable to both governmental and non-governmental organizations involved in land use planning and extension activities. Ultimately, this research played a crucial role in mitigating the adverse effects that burdened farmers.

1.6 Scope Of The Study

The study was conducted in Cheha woreda and it was conducted to assessment of agricultural land size fragmentation and its effects on agricultural productivity. The reason that researchers selected the topic agricultural land size fragmentation was on the base of background knowledge to this problem existing in the study area. The problem was like conflict between the families when the lands were fragmented, and crop production was directly decreased.

1.7 Limitation Of The Study

The major problems that were faced during data gathering were shortage of time, financial problems and another problem during the study was reluctance of respondents to fill the questionnaires. This may have been due to several reasons such as inability to understand the necessity of the researcher and being overburdened with work.

CHAPTER TWO

2. Review Of Related Literature

2.1 Theoretical framework

This study was grounded in five relevant theoretical frameworks that help explain the potential impacts of land fragmentation on agricultural productivity.

Neoclassical Production Theory

Neoclassical production theory postulates that farm productivity is dependent on economies of scale in agricultural production (Smith 1776; Ricardo 1821). Land fragmentation results in smaller and more scattered plot sizes, inhibiting efficient use of farm resources and machinery (Assunção and Ghatak 2003). This leads to higher production costs and lower productivity per unit area.

New Household Economics

Recognizing farms as complex social units, new household economics analyzes how intra-household decisions around labor allocation, input use and technology adoption are influenced by land tenure arrangements (Becker 1991; Udry 1996). Fragmentation may impair household specialization and technical efficiency (Kumar et al. 2022).

Transaction Cost Theory

Transaction cost theory argues that fragmented land systems increase contractual and information costs associated with negotiating and enforcing land rights (Coase 1937; North and Thomas 1973). These fragmentation costs diminish returns to agricultural production (Bravos-Gutiérrez et al. 2022).

Livelihood Framework

By examining impacts on different livelihood capitals, the livelihood framework provides lenses to assess how fragmentation shapes asset portfolios, activities, and outcomes over time (DFID 1999; Scoones 2009). It disrupts sustainable rural livelihood strategies (Partey et al. 2018).

Behavioral Economics

Insights from behavioral economics help understand how cognitive limitations influence smallholder responses to land fragmentation challenges (Kahneman and Tversky 1979; Thaler and Sunstein 2009). Biases may worsen its effects (Alem et al. 2015).

Together, these frameworks guide the empirical analysis of the pathways through which land fragmentation influences agricultural productivity in the study area.

2.2 Empirical Framework

This study employed a cross-sectional survey research design to empirically assess the impact of land fragmentation on agricultural productivity in Atat-Kebele.

Primary data were collected through a standardized questionnaire survey of deliberately selected farm households. The survey had gathered data on variables such as Level of land fragmentation (Fragmentation Index and other measures), Productivity indicators (yields, income, food security outcomes), Socioeconomic characteristics of households

This empirical strategy based on primary household survey data collected aims to provide robust evidence on the research issue within the local study setting.

2.3 Conceptual frameworks

This research aimed to empirically assess the impact of land fragmentation on agricultural productivity in Atat-Kebele. It analyzed how demographic factors like population growth and inheritance practices, socio-cultural dimensions such as family size and education levels, land tenure conditions including past redistribution policies and generations of fractured plot divisions, and socio-economic drivers of resource allocation patterns, contribute to higher levels of fragmented and divided land holdings as the independent variables. The study then seemed to

determine how this increased land fragmentation, measured through indicators like average plot size and number of dispersed plots, influences the dependent variables of agricultural productivity including crop yields, total farm outputs and incomes, and proxies for household food security. It is hypothesized that greater land division negatively impacts these productivity and food security outcomes via mechanisms such as diminished economies of scale, constraints on specialization, and weakened farm investment and technology adoption. Primary household survey data and secondary sources was used to provide empirical evidence on these relationships and pathways in the local study area.

2.3 Conceptual frameworks

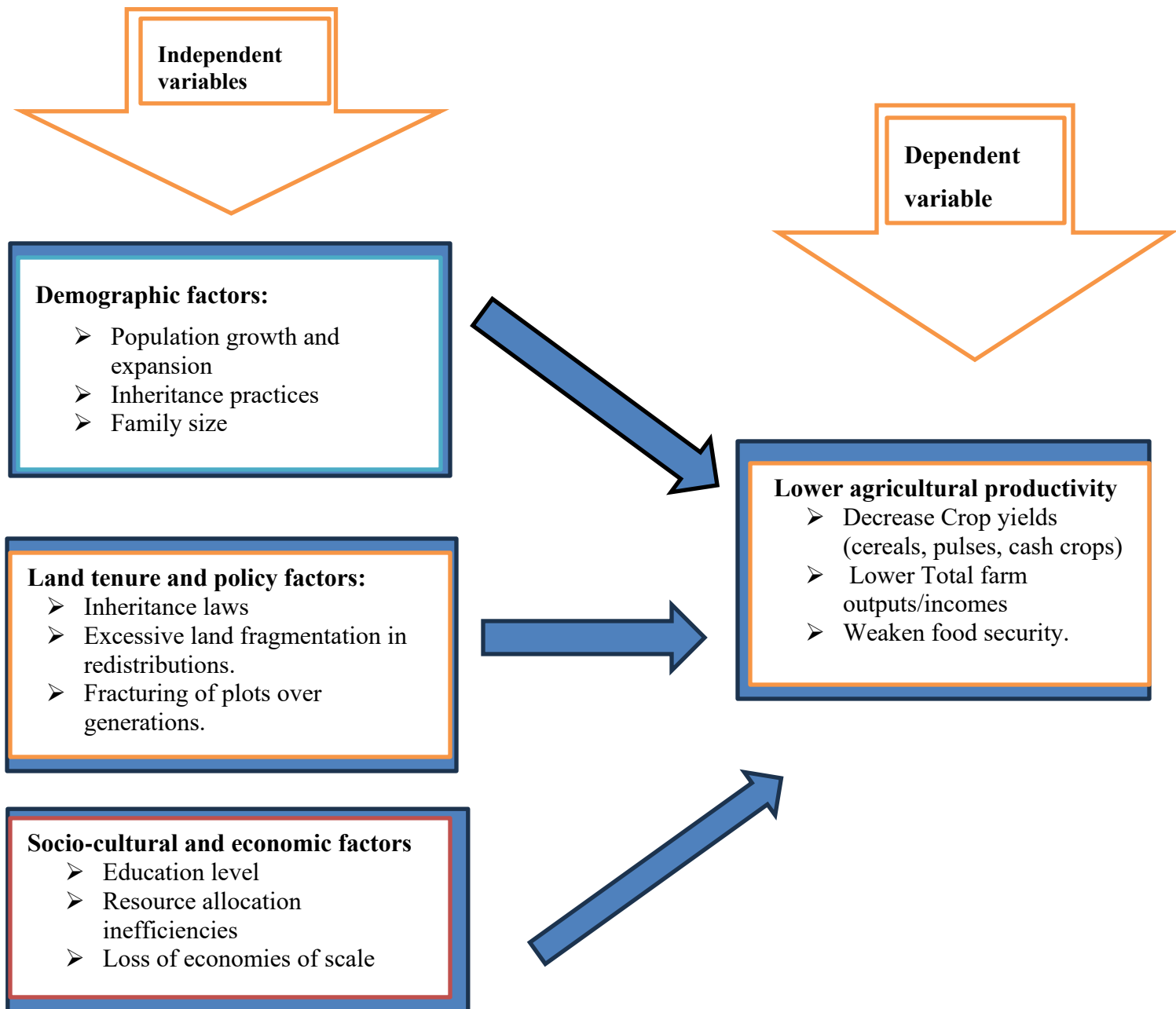


Figure 1 conceptual framework

2.4 Agricultural land fragmentation

Agricultural land fragmentation is widespread in the world and the result of various institutional, political, historical, and sociological factors such as inheritance laws collectivization and consolidation processes. transaction cost in land market urban development policies and personal valuation of land ownership. Land fragmentation is considered division of farmland into small farm as agricultural land size fragmentation. As a single farm considering numerous discrete parcels of the scattered over wider area evaluated both the cost and benefits of land fragmentation in the case of rice production in Japan similarly to Rahman (Kawasaki, 2010).

2.4.1. Advantage of agricultural land fragmentation

A benefit associated with land fragmentation is variety of soil and growing condition that reduce the risk of total crop failure by giving the farmer a variety of soil and growing conditions many different plots allow farmers access to land of different qualities when it comes to soil slope-micro-climatic variation etc (The World Bank, 2015).

Another benefit of land fragmentation is the use of multiple eco-zones .Different plots enable farmers to grow a wider mix of crop since crops ripe at different time when the plots are the different altitudes spreading out the agriculture work like harvest and sowing during a long period of time help farmers to avoid household labor bottlenecks .This is especially important when growing season of the crop is short and easily creates seasons of peak labor demand (Ibid).

2.4.2. Disadvantage of agricultural land fragmentation

Land fragmentation is said to harm productivity in several ways. First fragmented land holding can increase transport cost. If the plot are located far from the home and far from each other there is a waste of time for the workers spent on traveling in between the plots and home management supervision and securing of scattered plots can also be more difficult time consuming and costly small and scattered plots waste land area and require more land for fencing border construction and paths and roads .Land fragmentation might also increase the risk of disputes between neighbors' (Mweb Arose, Gaynor Richard, 2012).

2.4.3. Cause of agricultural land fragmentation

The cause of agricultural land fragmentation vary in different country's land fragmentation commonly results when implementation agrarian reform but, the phenomenon has developed in

different ways in different country's land distribution and redistribution, population growth, subsistence cropping, social ,cultural ,economic and physical processes are considered as causes of land fragmentation(Ten et al,2015-2016).

2.4.4. Economic impact of agricultural land fragmentation

The increasing population size of rural Ethiopia and the limited total land area .Especially in the high land farming area has been the cause for decaling perceptual landholding studies suggest that on average small land holding less than hector household most of the small plots of land is devoted to food production ,but households seldom produce enough crops to meet their family's consumption requirement .As the land is too small to produce any marketable surplus under the prevailing conduction .Subsistence and survival are over three riding concerns of the farmer this result in lack of cash of investment purchase of commercial inputs and purchase of oxen for land preparation(Ayele, 2013).

2.4.5 Farm size land fragmentation and smallholder production

Ethiopia is country of smallholder agriculture in the 2000 cropping season 87.4 percent of rural household operated less than 2 hectors. Whereas 64.5 percent of them cultivated small farms are fragmented on average into 2.3 plots the average farm size can generate only about 50 percent of the minimum income required for the average farm households to lead a life out of poverty. Farm size been taken to be synonymous with farm acreage because it can easily be ascertained and is sold days worked off-farm (for small-scale farm) level of farm income. To the level of total family income has commonly. If currently levels of farmer productivity and prices structures remain constant. such farmers have little (Samuel, 2016).

2.5. Land tenure

Land tenure security and market prices of agricultural commodities are determined by governmental laws and agricultural policies which is disguise influence farmers profit margins and land use decisions specifically, the land tenure plays one of the vital roles in shaping farmers land use decision (Rasul et al ,2004). In the area where shifting cultivation is common farmer need much of investment in land development, however their investment decision may be affected not sure how long they were allowed to use the ownership right if property right are absent and if land tenancy is insecure farmers do not care much about the land use and though

concentrate on short terms profit maximizing at the cost of accelerating the degradation of land (Cairns et al,2013).

2.5.1. Land fragmentation policies

The relationship between land and people is reflective although the livelihood of peoples is directly linked to land. The ownership of land is decreasing rapidly. Land fragmentation has been a prominent torture in many countries especially in the developing countries (Thepa et al ,2015).

2.5.2. Consolidation programs

Policy makers often propose land consolidation programs as a solution to the costs associated with land fragmentation. Land consolidation means that farmers surrender their scattered plots to receive an equivalent area most consolidation program are result of government policies ranging from large -scale mandatory programs to decentralized small program encouraging consolidation on a more voluntary basis. Programs often include new roads, irrigation systems, settlement schemes and related services (Mwebaza et al, 2012).

CHAPTER THREE

3. Research Methodologies

3.1 Description of the study area

3.1.1. Location

Guraghe Zone is one of the zones found in the Central Ethiopia Region It is in the western part of central Ethiopia; it is bordered on the south by Hadiya on the West, North and East by Oromia Region, Yem on Southwest and on the Southeast by Silte Zone.(Gebretsadik et al., 2018)

The geographical location of the study area extends from 8° 00' 18.9" to 8° 15' 28.53" N and 37° 35' 46.48" to 38° 03' 59.59" E.

Its land area is estimated as 593,200 hectares. The zone is divided in to 13 woredas and two town administrations. These are Abeshgie, Cheha, Enemor-Ener, Endegagn, Kebena, Ezha, Geta, Gummer, Mareko, Kokir, Mehurena Aklil, Meskan, Sodo Woredas and Butajira and Wolkite town administrations.(Gebretsadik et al., 2018)

The study was conducted in Cheha Woreda, located in Gurage Zone of Central Ethiopia region. The capital of the Woreda, *Imdbir*, is located at 188 km distance south of Addis Ababa on the way to Welkite town, the capital of the Zone. *Imdibir* means "*mother forest*" and is the combination of two words in the Gurage language, "*Im*" means mother and "*dibir*" means forest. This name clearly indicates that the area was once covered by forests (Gebretsadik et al., 2018)

Cheha woreda covers an area of 44,072 ha and its altitude ranges from 1200 m a. s. l. in the lowlands to 2600 m a. s. l. in the highlands. The annual rainfall of the area ranges from 800 to 1200 mm. *Enemor* Ener Woreda borders in the south, Oromia region in the west, Ezha Woreda in the East, Gumer and Geta in the Southeast, and Wabe River, which separates it from Abeshege, and Kebena in the North. The woreda constitutes 40 rural kebeles (the lowest administrative unit) of which 39 are rural and 1 is rural town.(Gebretsadik et al., 2018)

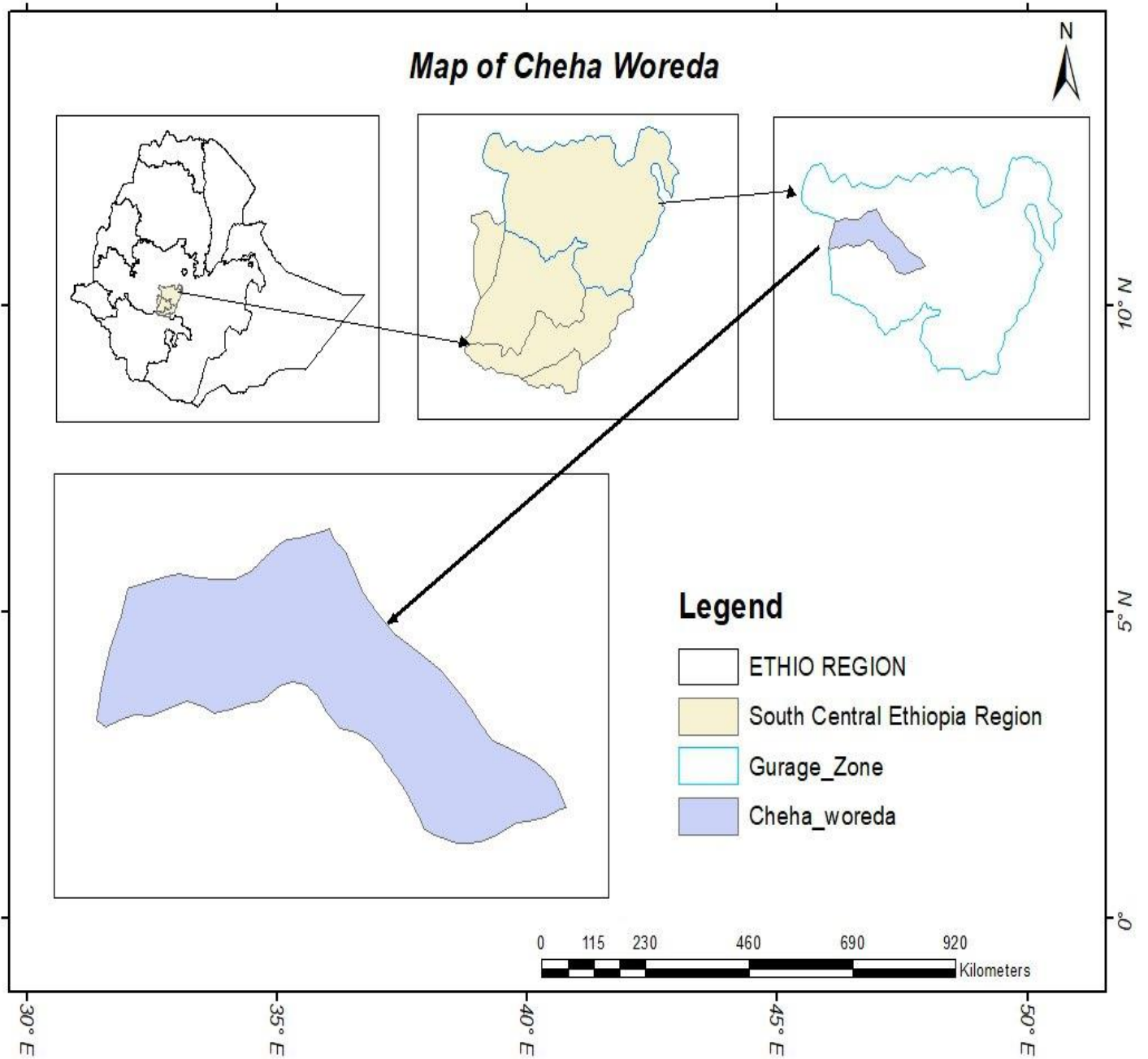


Figure 2 study area map

Study area map

(Credit; Mr.Abnet GeES department lab assistant, 2024)

3.1.3 Topography

The nature of topography in the zone exhibits three categories. These are the mountainous high land (represented by the Guraghe Mountain chain, dividing the zone east to west, having an elevation of 3600 m), the plateau flat lands and the low stretching area (the western fringe of the rift valley and the Wabe-Gibe valley having an elevation of 1000 m). The zone is divided in to three agro ecological zones namely “Dega” or highland climate (31.6%), mid highland climate or “Woina-dega” (65.3%) and lowland or “*kolla*” climate (3.1%). Most of the areas lie in the mid highland division. The distribution of rainfall and temperature mainly follows this pattern. The annual average rainfall ranges from 200 MM/annum - 1,400 MM/annum. The highest and lowest temperature record is 32° c and 7°c respectively.(Gebretsadik et al., 2018)

3.1.4 Demographic characteristic

The total population of the zone is estimated to be 1,398,945 (Guraghe Zone Finance and Economic Development Department, 2010 population projection) having distribution of 680,047male and 718,898 females with percentages of 48.6 and 51.4, respectively. Most of the population (90%) lives in rural areas leading an agricultural life.(Gebretsadik et al., 2018)

3.1.2. Climate

Rainfall and temperature conditions for Cheha woreda depend on elevation as it is the case for other parts of the country too. According to the Ministry of Agriculture (MoA) (1998), the agroecology of the area is classified into three agroecological zones. These agroecological zones include *Dega* (Highlands, 2,300 - 3,200 m a.s.l), *Weina Dega* (Midlands, 1,500 - 2,300 m a.s.l) and *Kolla* (Lowlands, 500 - 1,500 masl) (EIAR, 2011). The *Weina Dega* covers the largest part, which accounts for about 94 % of the total while both *Dega* and *Kolla* cover 6%. The information obtained from the Cheha Woreda Agriculture and Rural Development Office indicates that the area receives unimodal rainfall. '*Kiremt*', the main rainy season is from June to September with the peak in July and August. The short rainy season with erratic nature i.e. '*Belg*' extends from March to May.(Gebretsadik et al., 2018)

3.2. Research Methodology.

3.2.1. Research design

The researcher used a survey type of research for the study. Because survey studies were conducted to provide a detailed description of the existing phenomena condition with term of employing data to justify the current condition, by using this research type the study obtained precise general information about the current features of the society and it was very important to draw conclusions from reality. The study was conducted on agricultural land size fragmentation practices in the study area. In this method the researcher employed both quantitative and qualitative types of data.

3.2.2 Data source

The relevant data sources for this study included both primary and secondary data sources. Primary data sources were field surveys using questionnaires and interviews. Secondary data were collected from land administration offices of documents, books, literature documents reports and internet service.

3.2.3. Method of data collection

3.2.4. Primary data collection

Questionnaires

This instrument involved closed ended and open-ended questions that were basically constructed and employed to generate data from household heads on agricultural land size fragmentation.

Interview

A different checklist was prepared to gather the required information from 8 of respondents who were selected from rural kebele household heads or farmers.

Field Observation

Field observation started while writing the proposal and continued throughout the whole process of data collection to ensure the validity of acquired information. It aimed to understand the local conditions of the community in terms of their socio-economic situation, the current state of land

fragmentation. During walks, the researcher took notes on the causes of land fragmentation, effects on agricultural productivity, yield conditions and topography. Informally, informal interviews were occasionally carried out with farmers who were met along the way, aiming to obtain information to produce structured questionnaires which were the core instrument for the data collection and conducted in an informal way.

3.2.5. Secondary data collection

The secondary data were obtained from previous related research, books, and census reports. This secondary data was mainly accessed through soft copies over the internet, while hard copies found in woreda offices and libraries were also used.

3.3. Sampling size and sampling techniques

In Cheha wereda Atat kebele was selected using purposive sampling techniques. Because there was full awareness about socio-economic performance of the society, and this kebele was highly affected by land fragmentation due to high population growth, and not covering all kebeles would increase the sample size. The sample size was selected using convenience sampling techniques.

The sampling technique we chose for this study was convenience sampling. Since we did not have access to a complete list of all households in the kebele we studied, we could not use a probability sampling technique which requires a sampling frame with all elements of the population.

The kebele office did not currently maintain records of every single household's data, so developing our own comprehensive list would be very time-consuming and still may not have been fully accurate or up to date. Convenience sampling provided a workable alternative for our group to gain some insights from residents despite this limitation in available population data at the kebele level. While not ideal, it was the most feasible sampling method given the constraints of not having a full sampling frame as we conducted our research. From the total number of households of Atat kebele, we selected 42 respondents from the total households in Atat kebele as a sample using a convenience sampling technique.

3.4. Methods of data analysis

The data was collected through questionnaires and interviews. The available data from the study was analyzed through qualitative and quantitative methods. Qualitative data was analyzed in the form of verbal descriptions of the primary data and quantitative data was analyzed using tables, frequencies, and percentages.

Information obtained through interviews and observations was largely qualitative and presented in summarized form to supplement responses given in the questionnaire.

CHAPETER FOUR

4 DATA ANALYSIS AND INTERPRETATION

This chapter presents the analysis and discussion of data collected using questionnaires distributed to 42 respondents, 37 of which is responded.

A total of 42 questionnaires were distributed to the sample who are live in the study area and have an understanding about agricultural land size fragmentation and its effect on agricultural productivity in Atat kebele of Cheha Wereda. However, only 37 questionnaires were completed and returned, Therefore, approximately 88% of the questionnaires were successfully collected 5 questionnaires were not returned due to respondents being unavailable during the follow up visits to collect the completed questionnaires.

Part 4.1; Demographic characteristics of Respondents

The survey results regarding the demographic characteristics of respondents provide insights into the sample population studied with respect to agricultural land fragmentation in Atat kebele.

Age

	Characteristic	Frequency	Percentage
1.	Age		
	18-26	4	10.8%
	27- 35	9	24.3%
	36-44	15	40.5%
	.>44	9	24.3%

Table 0-1 Age of respondents

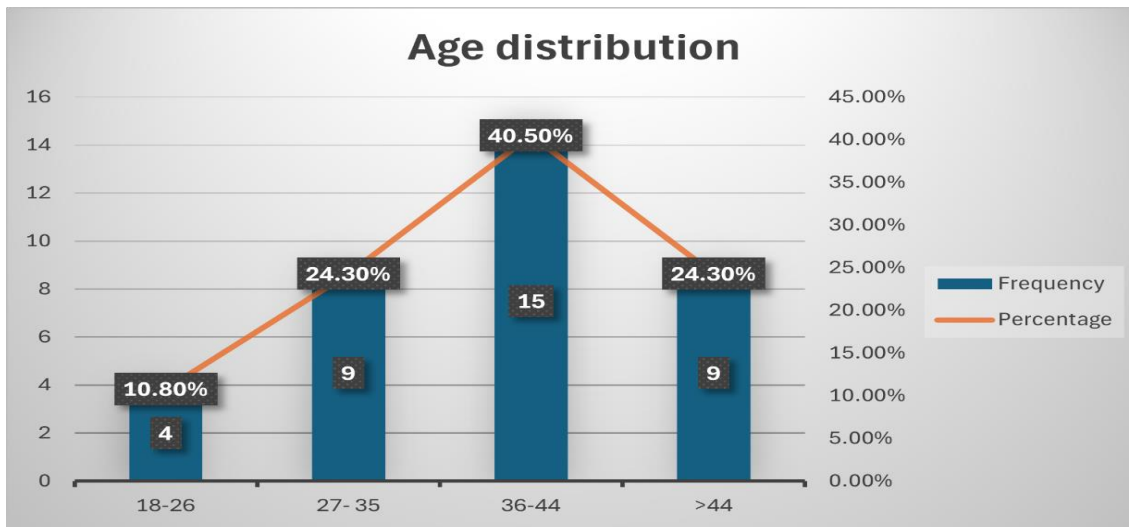


Figure 3 age of respondents

The researchers observed that the table provides demographic information on the age distribution of the study respondents, showing that the highest percentage (40.5%) fell within the 36-44 years age bracket, while the 27-35 years and greater than 44 years categories each accounted for approximately 24% of participants, and those between 18-26 years made up the smallest share at 10.8%. This age profile indicated that the sampled population predominantly consisted of middle-aged individuals who were likely at their prime productive and parenting stages of the life cycle, with the relatively low representation of the youngest and oldest cohorts possibly because agricultural farm activities and related decisions tended to involve heads of households within mature age categories. Overall, the age breakdown provided contextual insights about the life stages and experiences represented in the study, which have implications for perspectives obtained on topics such as land use practices, inheritance processes, and challenges faced over time, with the researchers aiming to further analyze whether differences exist across age dimensions in respondents' perceptions, knowledge, and impact assessments.

Sex

	Characteristic	Frequency	Percentage
2.	Sex		
	Male	25	67.5%
	Female	12	32.5%

Table 0-2 gender of respondents

The researchers observed that the table provides information on the sex characteristic of the study respondents. It was found that 25 (67.5%) of the respondents were male, while 12 (32.5%) were female, indicating that nearly two-thirds of the sampled population consisted of men. The findings provided important demographic context when analyzing respondents' perceptions and viewpoints captured during the study, as there may be differences in perspectives between male and female informants regarding challenges faced, division of labor, or decision-making dynamics around farming practices and land inheritance. Therefore, documenting the sex characteristic of the sample population offered meaningful insight into the socio-economic profile represented and informed further exploration of potential gender dimensions within the study's findings from the researchers' perspective.

Marital Status

	Characteristic	Frequency	Percentage
3.	Marital Status		
	Single	11	29.7 %
	Married	23	62.1 %
	Divorced	3	8.1 %

Table 0-3 Marital Status of respondents

The table provides information on the marital status characteristic of the study sample. An analysis of the frequencies and percentages revealed that over sixty percent of respondents (62.1%) reported being currently married, while approximately thirty percent (29.7%) identified as single and the remaining eight percent (8.1%) indicated divorced status. This marital profile suggested that the study predominantly captured perspectives from individuals who are legally married and likely managing agricultural responsibilities within familial partnerships. The researchers inferred that being married possibly influences outlooks shared on topics explored such as land inheritance practices governed by family traditions. The dominance of married informants also implied their median age was likely beyond when most locally typically wed. Noting such demographic characteristics enlightens understanding dynamics between social

Educational Level

4.	Characteristic	Frequency	Percentage
5.	Educational Level		
	Primary school	23	62.1 %
	Secondary school	10	27 %
	University degree	4	10.8 %

Table 0-4 Educational Level of respondents

The researchers found the table provides insights into the educational characteristics of study participants. An analysis showed over sixty percent of respondents reported attaining a primary school level of education, while approximately twenty-seven percent stated completing

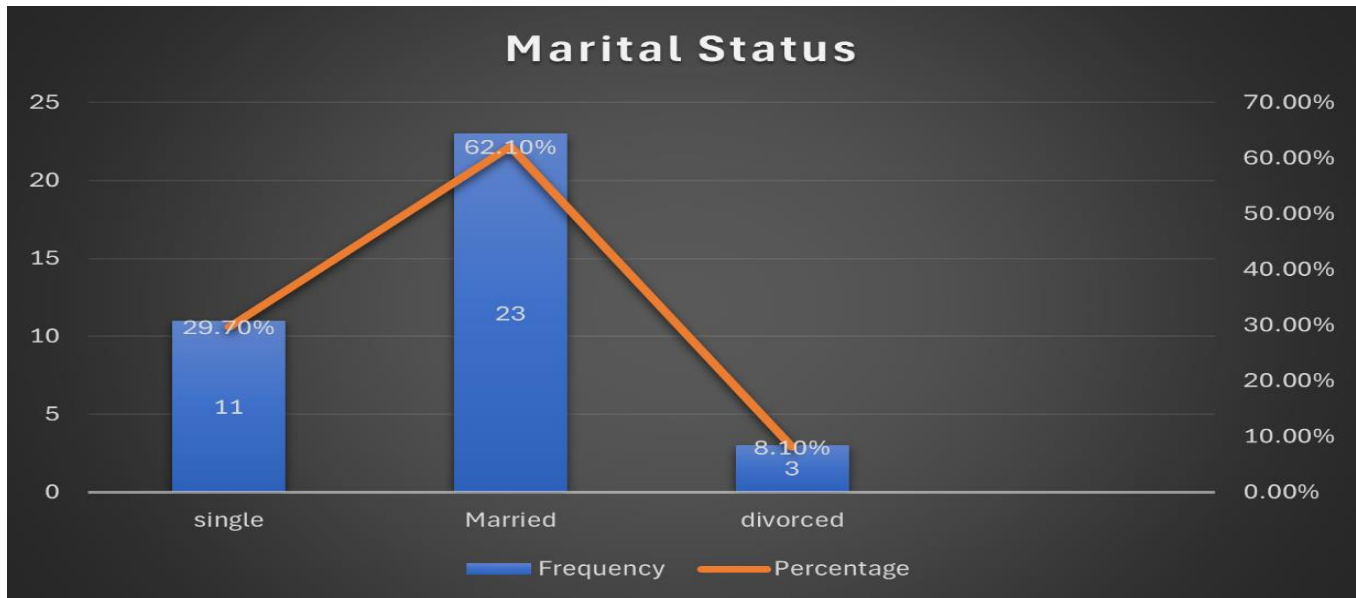


Figure 4 Marital Status of respondents

secondary school and nearly eleven percent acquired a university degree. This educational profile suggested most informants possessed fundamental literacy skills but lacked advanced qualifications. The researchers inferred this could influence perspectives shared, as attitudes may differ across knowledge levels. For instance, those with higher educational exposure may demonstrate variety in opinions compared to primary-educated participants regarding modernization or resilience-building of agricultural practices. Noting such socioeconomic attributes offered valuable context for comprehending how demographic factors intersect with

perspectives captured throughout interviews. Overall, the distribution implied enhanced equivalence across standpoints could be achieved through broadening the educational range of community members involved in future research initiatives.

What is your occupation/employment status

Table 0-5 occupation

	Characteristic	Frequency	Percentage
5	What is your occupation/employment status		
	Agriculture	17	45.9 %
	Trade	4	10.8 %
	Self-employee	8	21.6 %
	Student	2	5.4 %
	government employee	6	16.2 %

Table 0-6 occupation of respondents

Upon reviewing the occupation data within the "occupation.pdf" document, the researchers observed the table provides insight into respondents' employment characteristics. It was found that over 45% reported their primary work being agriculture, while smaller percentages included trade (10.8%), self-employment (21.6%), student status (5.4%), and government employment (16.2%). This implies agricultural production is the major source of livelihoods for nearly half the informants sampled. The researchers surmise this occupation profile could influence perspectives shared on topics such as perceived challenges and support needs due to direct ties to farming systems. It also suggests standpoints may not represent all community occupation types equally. This contextual insight is valuable for comprehending how livelihood factors shape how research issues are viewed. Moving forward, the researchers aim to recruit a more diverse set of informants according to local employment dynamics to facilitate nuanced understanding of diverse stakeholder perspectives.

Part 2 Questions Relate To land fragmentation.

Did you have your own land

	Characteristic	Frequency	Percentage
1	Did you have your own land		
	Yes	30	81 %
	No	7	19 %

Table 0-7 Did you have your own land

The researchers found the table provides insightful information relating to respondents' land ownership characteristics. It was revealed that the vast majority, 81%, reported owning their own land, while a minority of 19% stated they did not have land holdings. This landownership profile implies agricultural production activities for most informants were anchored on individually or family-held assets. The researchers surmise this could influence viewpoints shared throughout interviews on topics concerning land access, use, and management over time. For instance, those with secure land tenure may prioritize certain challenges differently than non-landowners. Noting such contextual attributes presents illuminating societal context for comprehending diverse stakeholder perspectives captured through this study. Tracking demographic factors like landownership status can aid interpreting research findings and planning future data collection efforts to encompass multifaceted community realities.

How much land do you have in hectares?

	Characteristic	Frequency	Percentage
2	How much land do you have in hectare? (this information is taken from 30 respondents who have their own land.)		
	<1 hectare	18	60 %
	<2 hectare	8	26.6 %
	<3 hectare	4	13.3 %
	>3 hectare	0	0 %

Table 0-8 amount of land in hectare

This survey provides valuable insight into landholding patterns among respondents in the study area. When examining the 30 farmers who own land, the data highlights an alarming trend of diminutive plot sizes. A clear majority of 60% reported holding less than 1 hectare of land, indicating extremely small and potentially unviable land parcels. While 26.6% had access to somewhat larger areas under 2 hectares, only 13.3% had between 2 to 3 hectares. No respondent held more than 3 hectares. These findings suggest severe land constraints for agricultural livelihoods, with average sizes possibly below threshold requirements even for subsistence level production. They also point to the chronic effects of ongoing fragmentation through inheritance. Qualitative work should interrogate whether such minuscule landholdings contribute to food insecurity and poverty, inhibit commercial opportunities, and drive further land sales or leasing that could exacerbate inequality over time. Addressing equitable access to an adequate land base is critical to rural development in this region.

	Characteristic	Frequency	Percentage
3	3. What looks like land fragmentation in your kebele?		
4	4. If your answer is very high and high what the reason is?		
	Very high	20	54 %
	High	13	35 %
	Medium	4	10.8 %
	Low	0	0 %

Table 0-9 like land fragmentation in your kebele

This data provides useful insights into the perceived levels of land fragmentation within the kebele according to local respondents. An overwhelming majority, constituting 54% of participants, reported that land fragmentation is "very high" - indicating a significant problem with excessively small and scattered plot sizes according to community perspectives. An additional 35% classified it as "high", together suggesting land fragmentation affects nearly 90% of the study area. Only 10.8% perceived a "medium" level of issue. Intriguingly, no respondents reported a "low" level of fragmentation. This consistent perception of prominently high or very high levels across 89% of participants implies landholdings within the kebele have become strikingly subdivided and inefficient. Further qualitative investigation into the key drivers behind this degree of fragmentation, such as inheritance practices, population pressures or policy

impacts, could help develop targeted interventions to encourage land consolidation where feasible and support sustainable rural livelihoods.

	Characteristic	Frequency	Percentage
5 6	5. Does land fragmentation have impact on your agricultural activity? (This information is taken from 17 respondents who are engaged in agricultural activities.) 6. If your answer is yes how is it?		
	Yes	17	100 %
	No	0	0 %

Table 0-10 impact on your agricultural activity

This survey data provides valuable insights into how local farmers perceive the impacts of land fragmentation within the study area. When asked whether land fragmentation affects their agricultural activities, all seventeen respondents engaged in farming unanimously agreed, as evidenced by a 100% response rate for “Yes”. While no qualitative details were collected about the nature of such impacts, this consistency across respondents suggests that fragmented and smaller plot sizes are significantly hampering agricultural production according to local perspectives. Further investigation could help understand how factors like plot access, management difficulties, input costs and yields may be influenced. Overall, the data implies land fragmentation is a serious challenge raising important concerns from a food security and rural livelihoods lens within this community. More in-depth interviews are merited to characterize specific impact pathways to better guide policy remedies.

About the impact of agricultural land size fragmentation on farm production:

"I have seen clearly how the divisions of our land have hurt crop yields and farm outputs over the decades. My father used to harvest over 300 kg from 1 hectare when I was young. Now my 0.25 hectare is split across 3 fields far apart, it takes all day just traveling between them. With the small plots, I avoid investing because profits would be tiny. Last season I managed only 150kg total. Fragmentation makes it near impossible to

farm efficiently and get good returns, pushing many like me closer to food insecurity each year." (INT 01, with 42-year-old man, 22/07/2016)

The above statement implies that agricultural land fragmentation has adversely impacted farm production in the study area by decreasing crop yields and total outputs. The respondent suggests that decreased plot sizes scattered over wide areas have led to reduced productivity on the land through inefficient farming practices, low investment incentives, and supply chain inefficiencies - reflecting how parcelization influences agricultural systems at the farm level.

	Characteristic	Frequency	Percentage
7	What did you think that the main cause of land fragmentation		
	Land Redistribution	5	13.5 %
	Population Growth	8	21.6 %
	Traditional Land Tenure Arrangement	13	35.1 %
	Government Policy Isotheres	11	29.7 %
	Others (Specify It) -----	0	0 %

Table 0-11 cause of land fragmentation

The survey elicits local perspectives on the primary drivers of land fragmentation in the study area. According to the plurality of respondents (35.1%), traditional inheritance and distribution practices under customary land tenure arrangements continue to be the major cause as they progressively subdivide plots over generations. However, other socio-economic factors were also recognized, including population growth cited by 21.6% as a contributor through intensifying land scarcity pressures. Meanwhile, 29.7% attributed indirect government policies as reinforcing fragmentation trends. Only a small minority of 13.5% associated land redistribution programmes directly. These findings offer contextual understanding on how both cultural norms and policy environments have likely interacted with demographic changes over the long-term to shape current landholding patterns locally. Going forward, comprehensive solutions are needed to address the population, land use and inheritance issues perpetuating smallholding challenges.

About the main cause of agricultural land size fragmentation:

"If you ask me, the major cause of our land problems has been the redistributions carried out by past governments. Back in the 1980s, most people here had large contiguous fields. But then the Derg came in and forcefully took everyone's land, measuring it strictly equal for all. Ever since, the cuts have only gotten smaller with each new round of divisions for the younger folks. Now I have just 1/4 hectare split across 4 scattered plots. It's impossible to make a farm at these levels." (INT 02, with 47-year-old man, 22/07/2016).

The above statement implies that governmental land redistribution policies aimed at promoting egalitarian land access have paradoxically contributed to the genesis and escalation of fragmentation challenges over time in the local study area context through their continual repartitioning of already subdivided plots. The respondent attributes the initial inception as well as worsening of fragmented smallholdings primarily to the direct interventionist land reforms of previous administrative regimes.

	Characteristic	Frequency	Percentage
8	8. Have ever observed land redistribution in your lifetime?		
9	9. If your answer for the above question is yes, how many times, what are the reasons?		
	Yes	23	62.1 %
	No	14	37.8 %

Table 0-12 redistribution in your lifetime

This survey captured farmers' experiences with land redistribution programs over their lifetimes. A significant majority of 62.1% respondents indicated observing at least one instance of redistribution in the past, highlighting this as an important mechanism shaping land access and holdings in the study area. However, without collecting specifics on redistribution frequencies, time periods or motivation, the open-ended question limited deeper understanding of implementation. Still, recurring redistributive cycles could have reinforced land fragmentation by further subdividing parcels over time according to 37.8% who did not witness such events.

Meanwhile, localized variation is also possible given mixed responses. Overall, the results point to both the role of state interventions in land tenure changes and need for follow up interviews providing more context on how past policies addressed, or failed to resolve, long-term pressures contributing to smallholding issues prevalent today according to other survey findings.

	Characteristic	Frequency	Percentage
10	How does land fragmentation could be a problem on your income?		
	Increase Additional Expense For Land Rent	4	10.8 %
	Decrease Crop Product	23	62.1 %
	Decrease Fruit And Vegetable Product	10	27 %
	Others_____	0	0 %

Table 0-13 land fragmentation problem on your income

This question elicited farmer perceptions on how land fragmentation can impact their incomes. The majority of respondents, 62.1%, believed it decreases crop production due to inefficiencies from small and scattered plots. A substantial 27% also associated fragmentation with reductions in higher-value fruit and vegetable yields. Meanwhile, 10.8% linked it to increased land rental costs when leasing parcels to consolidate cultivation. No other issues were mentioned. These perspectives provide useful insights for researchers, with the mainly cited pathways involving diminished productivity and higher costs of farming fragmented land plots. Further qualitative investigation could help understand the nuances of how plot fragmentation influences specific cropping choices, input use, labor allocation and related farm management practices with economic implications for rural livelihoods and food security according to local agriculturalists.

About the economic effects of agricultural land size fragmentation:

"The fragmentation of our agricultural land has made life very difficult. Before, my family had one large plot where we could cultivate various crops efficiently. But now after multiple inheritances, my portion of land is divided into 6 small plots scattered

across the countryside. It costs so much time and money to travel between the plots for farming. I cannot use machinery and have to hire extra labor, increasing my costs. With such small plots, I cannot produce enough to sell or even meet my family's needs some years. Fragmentation has really harmed me economically."(INT 03, with 45 years old woman, 22/07/2016)

From the above statement, the researcher understood that agricultural land fragmentation has led to higher production costs and lower incomes for rural households in the study area due to factors such as increased transport times, inability to benefit from economies of scale, and insufficient output to meet family consumption or generate surplus for sale.

	Characteristic	Frequency	Percentage
11	How did you measure it economic effect?		
	Lessen total employment	6	16.3 %
	Affect value added	12	32.4 %
	Business output	19	51.3 %
	Others	0	0 %

Table 0-14 economic effect of land fragmentation

The respondents were asked to indicate how they perceive the economic impacts of land fragmentation are measured. Over half of farmers at 51.3% associated fragmented plots with a reduction in overall business output for their holdings. Additionally, 32.4% linked it to decreased value added from their agricultural activities. A fewer 16.3% believed it lessens total employment opportunities. No other means of measuring economic effects were included by respondents. These perspectives suggest local farmers primarily understand the financial consequences of land fragmentation to be reflected in diminished productivity and income-generating potential from their farm enterprises. Additional qualitative research could provide richer insights into how factors such as plot accessibility, crop choices and livelihood strategies may be influenced based on these perceived economic cost metrics.

About the economic effects of agricultural land fragmentation:

"Since inheriting my family's land, I have found it very difficult to make a good living from farming. My 1 hectare of land has been divided into 4 small plots in different locations due to past redistributions. It is so inefficient - I spend much of my day walking between plots instead of working. I cannot afford oxen or farm equipment on these tiny plots. The yields are low and costs high. I struggle to support my family and often must find additional work in town. Fragmentation has destroyed agriculture as a means of sustaining my household." (INT 04, with 40 years old man, 22/07/2016)

From the above statement, the researcher understood that land fragmentation negatively impacts the economic viability of agriculture as a livelihood activity in the study area. The respondent highlighted how fragmented small plots increase production costs through lost time, while preventing scale of operation needed to adopt technologies or generate sufficient output - undermining agriculture's ability to adequately support rural households.

About the role and responsibility of the government regarding agricultural land size fragmentation:

"The government needs to take this issue more seriously before our fields are too tiny to farm. They were the ones who initially redistributed the large holdings without considering the future problems of endless divisions. Now when we complain about fragmented tiny plots, officials do nothing. If the trends continue unabated, soon no one will have land to cultivate at all. The administration must step in with clear rules and help merge parcels if people agree, or else provide other work opportunities for younger generations." (INT 05, with 50-year-old man, 22/07/2016).

The above account depicted that the respondent believes the government bears significant responsibility to proactively address agricultural land fragmentation given its past involvement in redistributions that initiated the trend of declining plot sizes over time. He underscores the need for administrative authorities to acknowledge their role through enacting appropriate policies and support measures to curb unrelenting parcelization that poses risks to long-term rural food and livelihood security according to local perceptions.

CHAPTER FIVE

5.CONCLUSION AND RECOMMENDATION

5.1 Conclusions

This study explored the causes and impacts of land fragmentation in Atat Kebele. Findings reveal traditional inheritance dividing family estates as the predominant driver fragmenting landholdings over generations. Meanwhile, demographic pressures from population growth concentrating on finite farmlands and past redistribution policies disrupted land configurations according to interviews.

As average sizes reduced, fragmentation compromised productivity in multiple ways. Highly scattered plots prevent using machinery and realizing scale economies that lower input costs essential under low-input systems. Fragmentation also makes optimum input application and intensive management practices difficult according to the survey. The lack of consolidated areas further discourages diversifying toward higher-value crops requiring contiguous plots as perceived by respondents.

Time spent moving between dispersed pieces reduces productive working hours available for critical field activities like weeding and spraying while increasing labor burdens. Such inefficiencies dampen yields, harvests, and farm-gate incomes that form the core livelihood strategy for most households. Over time, constraints weaken incentives for technological change that could bolster productivity of labor-absorbing smallholder agriculture.

Government policies past aimed to redistribute farmland failed to safeguard average sizes, exacerbating challenges. While some monitoring exists, officials recognize limitations of manual record-keeping according to interviews. Institutionalizing digitized land registries systematically documenting inheritance-driven subdivisions is needed. Enhanced monitoring is imperative to design well-targeted programming according to this research.

Overall, legacy challenges inherited from previous generations now threaten efforts to promote rural prosperity, regional production, and long-run food security nationally if left unaddressed.

Comprehensive reform guided by robust evidence is imperative to redress unintended consequences that deepen vulnerabilities for the most resource-dependent populations.

5.2 Recommendations

Based on the findings of this research on the impacts of land fragmentation in Atat Kebele, the following policy recommendations are proposed:

The Ethiopian constitution addresses land tenure system and land fragmentation in several articles.

“Article 40 of the Ethiopian Constitution specifically addresses land tenure. Here is the text of Article 40:

Article 40 - Right to Property

- 1. Every Ethiopian has the right to own property, whether individually or in association with others.*
- 2. The right to own rural and urban land, as well as all natural resources, is exclusively vested in the State and the people.*
- 3. Land is a common property of the Nations, Nationalities and Peoples of Ethiopia and shall not be subject to sale or to other means of exchange.*
- 4. Without prejudice to the right of farmers to obtain land without payment and the protection of their possession, land may be held, used and transferred in accordance with the law.*

Regarding land fragmentation, while the Ethiopian Constitution does not specifically address this issue, land fragmentation is a common challenge in many parts of Ethiopia, particularly in rural areas where land is divided among family members over generations. This can lead to inefficient land use, reduced agricultural productivity, and disputes over land ownership. Efforts to address

land fragmentation may involve land consolidation programs, land use planning, and support for more sustainable and productive farming practices.”

1. Introduce legal limits on subdivision of agricultural land parcels below 1 hectare to curb further fragmentation.
2. Implement largescale land consolidation programs through participatory planning and infrastructure development.
3. Promote high-value crops, irrigation, climate-smart techniques and off-farm skills training to improve productivity on small plots.
4. Strengthen land administration through digital records and remote sensing to monitor fragmentation trends over time.
5. Develop advisory services, seed/machinery packages and water technologies tailored to fragmented landscapes.
6. Prioritize rural enterprise development through business centers and out grower schemes to generate alternative incomes.
7. Control population growth through strengthened family planning to reduce pressure on limited agricultural resources.
8. Conduct periodic surveillance surveys incorporating fragmentation, productivity, food security and incomes indicators.
9. Adopt multi-sectoral and evidence-based long-term planning through coordinated efforts across different stakeholders.

REFERENCES

- Alem, Y., Boucher, S., & Boucher, S. R. (2015). Factor Markets, Land Sales Restrictions, and Agricultural Productivity. *American Journal of Agricultural Economics*, 97(4), 1134–1154. <https://doi.org/10.1093/ajae/aav025>
- Alem, Y., Boucher, S., Boucher, J. P., & Soman, D. (2015). Behavioral economics. Environment for Development. Discussion Paper Series.
- Assunção, J.J. and Ghatak, M., 2003. Does land reform affect agricultural productivity? Evidence from Brazil (1961 to 1980). *Journal of Development Economics*, 70(2), pp.497-521.
- Austin, O. C., Ulunma, A. C., & Sulaiman, J. (2012). Exploring the Link between Land Fragmentation and Agricultural Productivity. *International Journal of Agriculture and Forestry*, 2(1), 30–34
- Baghdadi, N., & Zribi, M. (2016). *Land surface remote sensing in agriculture and forest*. Elsevier.
- Becker, G. S. (1991). *A Treatise on the Family*. Harvard University Press.
- Berhanu, W., & Poulton, C. (2014). The political economy of agricultural extension policy in Ethiopia: Economic growth and political control. *Development Policy Review*, 32(S2), s197-s215. <https://doi.org/10.1111/dpr.12079>
- Bravos-Gutiérrez, J., Olaizola, A. M., & Roibás, D. (2022). Land fragmentation and agricultural productivity in Brazil. *Land Use Policy*, 111, 105693.
- Cairns, (2003). Land rights systems and agricultural development in sub-Saharan Africa. World Bank research observer.
- Coase, R. H. (1937). The nature of the firm. *Economica*, 4(16), 386-405.
- Cramer, C., Sender, J., & Oqubay, A. (2020). African Economic Development. In *Oxford University Press eBooks*. <https://doi.org/10.1093/oso/9780198832331.001.0001>
- Deininger, K. and Jin, S., 2006. Tenure security and land-related investment: Evidence from Ethiopia. *European Economic Review*, 50(5), pp.1245-1277.
- Gebretsadik W, Weldemariam Z, Adane (2018) *Characterization of Agro forestry Practices and their Socioeconomic Role in Selected Districts of Gurage Zone, Ethiopia*

- Holden, S. T., Stein, T. V., & Vadhani, R. S. (2003). Land fragmentation and land productivity in Ethiopia (CMI Report No. 2003:9). Chr. Michelsen Institute.
- Holden, S., & Yohannes, H. (2002). Land redistribution, tenure insecurity, and intensity of production: A study of peasant farmers in southern Ethiopia. *Land Economics*, 78(4), 573-590. <https://www.jstor.org/stable/3146835>
- Holden, S.T. and Yohannes, H., 2002. Land redistribution, tenure insecurity, and intensity of production: A study of farm households in Southern Ethiopia. *Land Economics*, 78(4), pp.573-590.
- Kahneman, D., & Tversky, A. (1979). Prospect Theory: An Analysis of Decision under Risk. *Econometrica*, 47(2), 263–292. <https://doi.org/10.2307/1914185>
- Kawasaki, (2010). The cost and benefits of land fragmentation of Japan Australia of agricultural and resource economics vol.54,99,509-526.
- Kebele manager offices report, (2023).
- Kumar, N., Pender, J., Pico, J. de los A., & Negash, M. (2022). Agricultural Transformation and Land Tenure Arrangements in Africa: Empirical Evidence from Ethiopia. *Land Economics*, 98(2), 255–290. <https://doi.org/10.3368/le.98.2.255>
- Kumar, N., Saravanan, C., & Shankar, B. (2022). Intra-household bargaining power and technical efficiency on marginal and small farms in India. *World Development*, 151, 105685.
- Kumar, S., Wani, S. P., Sreedevi, T. K., Singh, B., & Pathak, P. (2011). Impact of land fragmentation and resource degradation on productivity and equity in rain-fed farming systems of Central India. *Economic and Political Weekly*, 46(26-27), 51-62.
- *Land tenure in Ethiopia: continuity and change, shifting rulers, and the quest for state control*. (2008). <https://doi.org/10.2499/capriwp91>
- Milano, V., Odhiambo, B., & Kirimi, L. (2020). Land fragmentation and consolidation: Evidence from Rwanda. *Land Use Policy*, 96, 104672. <https://doi.org/10.1016/j.landusepol.2020.104672>
- MOA, (1989). Land fragmentation reduces risks by giving several of soil and growing condition In Ethiopia.
- Mwebaza Rose, Gaynor. Richard, (2012). Land sector analysis, land market ,land consolidation and land re-adjustment component ,rural development institute .The government of the republic of Uganda .

- North, D. C., & Thomas, R. P. (1973). *The rise of the western world: A new economic history*. Cambridge University Press.
- Partey, S. T., Zougmore, R. B., Ouedraogo, M., & Campbell, B. M. (2018). Effects of climate risks on farmer livelihoods in Sahelian West Africa. *Climate Risk Management*, 20, 55-64.
- Place, F. et al., 2007. The economic effects of land fragmentation: Evidence from Rwanda. *World Development*, 35(11), pp.1867-1883.
- Rasul et al, (2004). Measuring the production efficiency of alternative land tenure contracts in a
- Ricardo, D. (1821). *On the principles of political economy and taxation*. John Murray.
- Samuel Gebreselassie, (2016). *Land Policy and smallholder agriculture in Ethiopia option and Scenarios*.
- Scoones, I. (2009). Livelihoods perspectives and rural development. *The Journal of Peasant Studies*, 36(1), 171-196.
- Smith, A. (1776). *An inquiry into the nature and causes of the wealth of nations*. W. Strahan and T. Cadell.
- Thaler, R. H., & Sunstein, C. R. (2009). *Nudge: Improving Decisions About Health, Wealth, and Happiness*. Penguin Books.
- The Constitution of the Federal Democratic Republic of Ethiopia. December 8, 1994.
- The world bank, (2015). *Land consolidation issues in northern Vietnam-institutions, implementation impact*.
- Thepa et al,(2015) .*Assessment of impact in high fragmentation of land up on the productivity and profitability of farmers in Ethiopia*.
- Udry, C. (1996). Gender, Agricultural Production, and the Theory of the Household. *Journal of Political Economy*, 104(5), 1010–1046. <https://doi.org/10.1086/262050>
- Van hung,macaulay ,marsch,(2016).*The economics of land fragmentation in the north of vietnam* .The university of Sydney.

APPENDIX
WOLKITE UNIVERSITY
COLLEGE OF SOCIAL SCIENCE AND HUMANITIES
DEPARTMENT OF GEOGRAPHY AND ENVIRONMENTAL STUDIES
QUESTIONNAIRES

This questionnaire is prepared to collect data for research purpose by undergraduate students of geography and environmental studies on agricultural land size fragmentation and its effect on agricultural productivity in Atat kebele of Cheha Wereda.

Direction

Choose one answer from give alternative and fill the blank space and depend on instruction write your answer on the space.

Part 1(Background information of the respondent)

1. Age

- A. 18-26 B. 27- 35 C. 36-44 D.>44

2. Sex

- A. male B. Female

3. Marital status

- A. married B. not married C. divorced

4. Educational status

- A. primary B. secondary C. degree D. read and write

5. Occupational status

- A. agriculture B. trade C. government employee D. Student E. Self-employee

6. Religious status

- A. orthodox B. protestant C. Muslim D. Catholic E. others

Part 2 Questions Relate To land fragmentation.

1. Did you have your own land

- A. yes B. No

2. How much land do you have in hectare?

- A. <1 B. < 2 C. < 3 hectare D. >3

3. What looks like land fragmentation in your kebele

- A. very B. high C. medium D. low

4. If your answer is very high and high to the above question no.3 what the reason is

.....

5. Does land fragmentation have impact on your agricultural activity?

- A. Yes B. No

6. If your answer is yes for the above question how is it? -----

7. What did you think that the main cause of land fragmentation

- A. land redistribution B. population growth C. traditional land tenure
arrangement D. government policy Isotheres E. others (specify it) -----

APPINDEX II

Amharic Version Questionnaire

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መጠይቅ

ውድ ተሳታፊዎች

ይህ መጠይቅ የተዘጋጀው በጂኦግራፊ እና የአካባቢ ጥናት ትምህርት ክፍል የቅድመ ምረቃ ተማሪዎች ሲሆን የተዘጋጀበት አላማም በግብርና መሬት መጠን መከፋፈል(ማነስ) በግብርና ምርት ላይ በቸሃ ወረዳ ውስጥ ያለውን ተጽዕኖ ለመረዳት የተለያዩ መረጃዎችን ለመሰብሰብ ነው።

አጠቃላይ መመሪያ

- ለተዘጋጁት ጥያቄዎች ከተዘጋጁት አማራጮች መካከል አንድ መልስ ይስጡን እንዲሁም የተዘጋጀውን ክፍት ቦታ በመሙላት ከቀረበው ጥያቄ ተገቢውን ምላሽ ያስቀምጡልን።
- ስም መጻፍ አያስፈልግም።
- በእያንዳንዱ ጥያቄዎች መመሪያ ላይ መመሪያ ተቀምጧል።

ክፍል 1 የተሳታፊዎች አጠቃላይ መረጃ ጥያቄ

እባክዎ እርሶ የመረጡት ላይ ያክብቡ።

1. ያታ:

1. ወንድ 2. ሴት

2. ዕድሜ

1. 18-26 2. 27- 35 3. 36-44 4. >44

3. የጋብቻ ሁኔታ

1. ያገባ 2 ያላገባ 3. የፈታ

4. የትምህርት ደረጃ:

- 1. አንደኛ ደረጃ 2. ሁለተኛ ደረጃ 3. የመጀመሪያ ዲግሪ 4. ማንበብና መጻፍ
- 5 የስራ ሁኔታ

- 1 ግብርና 2 ንግድ ሥራ 3 የመንግስት ሰራተኛ 4 ሌላ
- 5 ሃይማኖት

- 1 ኦርቶዶክስ 2 ፕሮቴስታንት 3 ካቶሊክ 4 ሙስሊም 5. ሌላ

ክፍል 2 በግብርና መሬት መጠን መከፋፈል (ማነስ) ጋር የተገናኙ ጥያቄዎች

1 የራሱ የ እርሻ መሬት አሎት? 1. አለኝ 2. የለኝም

2. ምን ያክል ሄክታር መሬት አሉ?

- 1 < 1 2 < 2 3 < 3 4 > 3

3 መሬት መጠን ማነስ በእናንተ ቀበሌ ውስጥ ምን ይመስላል

- 1 በጣም ከፍተኛ 2 ከፍተኛ 3 መካከለኛ 4 ዝቅተኛ

4 ከላይ ለተጠየቀው ጥያቄ ቁጥር ሶስት መልሶ በጣም ከፍተኛ ወይም ከፍተኛ ከሆነ ምክኛቱን ያስቀምጡ.....

5 መሬት መጠን ማነስ በእናንተ የግብርና ምርት ላይ ተጽዕኖ አለው ብለው ያምናሉ? 1 አዎ 2 አይ

6 ከላይ ለተጠየቀው ጥያቄ ቁጥር 5 መልሶ አዎ ከሆነ እንዴት ተጽዕኖ እንዳደረገቦ ያሳዩ ?.....

7 የግብርና መሬት መጠን ማነስ ዋነኛ መንስኤው ምንድነው ብለው ያምናሉ ?

- 1 የመሬት መከፋፈል 2 የህዝብ ብዛት መጨመር 3 ባህላዊ መሬት የማውረስ ህግ 4 የመንግስት ፖሊሲ 5 ሌሎች ምክኛቶች

8 በህይወት አጋጣሚ የመሬት ክፍፍል ገጥሞት ያውቃል? 1 አዎ 2 አይ

9 ከላይ ለተጠየቀው ጥያቄ ቁጥር 8 መልሶ አዎ ከሆነ ምን ያክል ጊዜ ምክኛቶቹን ምንድን ነበሩ ?.....

10 የግብርና መሬት መጠን ማነስ እንዴት ነው የእርሶ ገቢ ላይ ችግር ሊሆን የሚችለው?

- 1 ለመሬት ኪራይ ተጨማሪ ክፍያ ስለሚተይቅ 2 ምርት መጠን ስለሚቀንስ
- 3 . የፍራፍሬ እና የአትክልት ምርቶችን ይቀንሱ 4 ሌሎች

11 የግብርና መሬት መጠን ማነስ በግብርና ምርት ላይ ምን ያክል ተጽዕኖ እንዳለው እንዴት ያውቃሉ

- 1 አጠቃላይ የስራ እድል መቀመስ 2 በምርታማነት መቀነስ 2 ምርት ጥራት መቀነስ 4. ሌሎች

ክፍል 3 የቃለ ምልልስ ጥያቄዎች

1 የግብርና መሬት መጠን ማነስ ኢኮኖሚያዊ ጉዳቱን እንዴት ይገልጻል?

2 የግብርና መሬት መጠን ማነስ ዋነኛ መንስኤው ምንድነው?

3 የግብርና መሬት መጠን ማነስ በግብርና ምርት ላይ ያለው ተጽዕኖ ምንድነው?

4 3 የግብርና መሬት መጠን ማነስን ለመከላከል እና ለመቆጣጠር ምን ምን አይነት እርምጃዎችን እየወሰዱ ነው?

5 የግብርና መሬት መጠን ማነስን ለመከላከል እና ለመቆጣጠር የመንግስት ድርሻ እና ሃላፊነት ምንድነው ብለው ያምናሉ ?