COLLEGE OF DEVELOPMENT STUDIES

CENTER FOR ENVIRONMENT AND DEVELOPMENT

CONTRIBUTIONS OF CLUSTER FARMING TO THE LIVELIHOOD OF FARMERS, A COMPARATIVE STUDY AT SIYADEBRINA WAYU WOREDA, NORTH SHEWA, ETHIOPIA

BY

WOGDERES EJIGU ENDAZNOW

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ADVISOR- BELAY SIMANE (PROFESSOR)

A THESIS SUBMITTED TO CENTER FOR ENVIRONMENT AND SUSTAINABLE DEVELOPMENT IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF MASTER OF ART IN ENVIRONMENT AND SUSTAINABLE DEVELOPMENT.

JULY, 2020

ADDIS ABABA

Addis Ababa University

School of Graduate Studies

This is to certify that this thesis is prepared by Wogderes Ejigu Endazanow, entitled: **Contributions of cluster farming to livelihood of farmers, a comparative study at Siyadebrina Wayu woreda, North Shewa, Ethiopia**. Submitted to center for environment and Sustainable Development in partial fulfillment of the requirements for the degree of master of art in Environment and Sustainable Development complies with the regulations of the university and meets the accepted Standards with respect to originality and quality.

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STATEMENT OF DECLARATION

I, Wogderes Ejigu, here declare that this thesis entitled "**Contributions of cluster farming to livelihood of farmers, a comparative study at Siyadebrina Wayu woreda, North Shewa, Ethiopia"** submitted by me for the award of the degree of Master of Arts of Environment and Sustainable Development. Addis Ababa University at Addis Ababa, Ethiopia is my Original work and it has never been presented in any university. All sources and materials used for this thesis have been duly acknowledged**.**

Name: Wogderes Ejigu

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Date of Submission **July 21, 2020.**

Department: Environment and Sustainable Development.

This master of thesis has been submitted for examination with my approval as thesis advisor.

Advisor Name **Belay Simane (professor)**

Signature_____ Date_____

ACKNOWLEDGMENT

First and foremost I would like to acknowledge and Praise the Almighty God who is with me always. I am highly interested to acknowledge Professor Belay Simane who provides me valuable comments from the proposal stage to the final work of my thesis. It would have been very difficult for me to conduct the research and to produce this thesis in such ways without the guidance and suggestion of Professor Belay. He is not only an advisor he is a very welcoming person. I also acknowledge Dr. Tesfaye the former head of the center of Environment and Development for his assistance at the Preliminary stage of the proposal. I also would like to thank my childhood close Friend and brother Bayou Abere and Andulalem who works at Woreda AGP and Siyadebrina wayu office of Agriculture respectively. I am also highly interested to thank all my sample respondent farmers of Dawo Kombolcha Kebele. Last but not least I am highly delighted to thank my beloved Wife Emebet Adnew/ Emuya/and my kids Bezawit and Rahel Wogderes. If they were not supportive for me it may be difficult to reach here.

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Lists of Acronym and Abbreviations

ATA	Agricultural Transformation Agency
ATVET	Agricultural Technical and Vocational Education Training College
ATTSVE	Agricultural Transformation Through Stronger Vocational Education
BAU	Business As usual
CFP	Cluster Farming Participants
CSA	Central Statistical Agency
DA	Developmental Agent
DAG	Developmental Assistance Group
FAO	Food and Agricultural Organization
FDRE	Federal Democratic Republic of Ethiopia
GDP	Gross Domestic Product
GTP	Growth and Transformation Plan
IFPRI	International Food Policy Research Institute
IVS	Input Voucher system
PMO	Program Management Office
RTC	Regional Transformation Councils
VC	Value Chain

Abstract

The idea of the Agricultural cluster was introduced in Ethiopia together with Agricultural commercialization cluster as a means of integrating different prioritized interventions in the transformation Agenda, within specific geographies targeting a limited number of high-value commodities during the first Growth and Transformation Plan (GTP) of Ethiopia. This research paper is focused on studying the contributions of cluster farming to the livelihood of farmers, at Siyadebrina Wayu woreda, North Shewa, Ethiopia. The major problems related to cluster farming are like poor financial access, low market linkage, low mechanization and poor infrastructure. The overall objective of this research was to examine *the contributions of cluster farming to the livelihood of the farmers at Siyadebrina Wayu woreda of North Shewa zone. The study used both qualitative and quantitative methods. Primary and secondary data's were generated by employing both qualitative and quantitative methods. Purposive and simple random sampling techniques were applied to select 130 cluster farming participants' farmers and 80 businesses as usual farmers were involved farmers. In the process of the research both cluster farming participants' as well as farmers who were not involved in the cluster farming were involved. The quantitative data generated were analyzed using SPSS software. The research finding reveals that farmers, who were engaged in Cluster farming, get better amount production of wheat per hectare of land as compared to business as usually farmers The research further reveal as the market linkage created among the cluster participant farmers and the Farmer union of the kebele, with the aim of creating better opportunities for cluster participant farmers, was not as such strong due to the overall limited capacity of the farmer union. Interms of getting modern inputs like fertilizers and improved seeds the research proved as there were delays in getting them on timely bases. On the other hand in relation to combiners and harvesters, even though there was a high demand in getting them on rental bases to overcome the high costs of daily laborers and untimely rain which affects their products while in the field, the research proved as farmers were not able to get combiners and harvesters. Interms of other social indicators the research further proved as the cluster participants farmers have better improvement in terms of sending their children to school, depositing money and having an assets, constructing separate house for their cattle's and changing their life style as compared to the non-cluster participant farmers. Finally this study recommends that cluster farming should be strengthened to the extent of involving more number of farmers and by being introducing different improved seeds in the system and by providing all the necessary advisor service to the farmers through the woreda office of Agriculture and to strengthening the market linkage with the farmers union.*

***Key words**: - Cluster, cluster farming, Business as usual, Mechanization, Improved seeds, Market linkage, Farmers Union*

UNIT ONE: INTRODUCTION

1.1 Background of the study

Changing the traditional forms of Agriculture to Commercialization of farming with the applications of modern inputs is considered as the most effective means of solving the problem of the population who are with poverty in the developing world (Carletto, 2017:31). Agricultural cluster has so many benefits in changing this traditional form of Agriculture to modern forms with the following benefits. The benefits include, promotion of vertical and horizontal linkage among actress, improve once access to market information and strength the support given to the cluster communities.[1]

As compared to developed countries, though a cluster activity in the continent of Africa is at the very infant stage, there has been some efforts of labor that has been exhausted in some English-speaking countries, the analysis up to now suggest as there's huge opportunity for positive agricultural cluster interventions at each policy and program levels. The analysis identifies three Agricultural sector clusters in the continent of Africa. These were a fish clusters in the republic of Uganda, a cut flower in the republic of Kenya and a wine cluster in the republic of South Africa (McCormick, 1998, 1999; Mitullah, 1999).

The ACC was commenced as an "Anchor Initiative" in the last year of the GTP I (2014/15) by ATA, with the aim of integrating the four pillars of the second phase of the transformation agenda – increasing crop and livestock production and productivity; environmentally sustainable and inclusive growth; commercial orientation of smallholder agriculture and market development; enhancing implementation capacity - in specific strategic locations and commodity value chains ATA (2017).

The idea of the agricultural cluster was introduced in Ethiopia together with agricultural commercialization cluster as a means of integrating different prioritized interventions in the transformation Agenda, within specific geographies targeting a limited number of high-value

[1] cluster approaches to agro-enterprise Development, Lessons from Maharashtra grape cluster

commodities during the first Growth and Transformation Plan (GTP) of the country (FDRE 2010/11). The approach of the Ethiopian Agricultural cluster (ACC) that was at first occurred by the request of the then prime minister of Ethiopia in 2014 was to seek out a way that helps for the combination of geographically targeted interventions and to make sure, rapid, sustained and inclusive development of agricultural trade goods price chain. On the Ethiopian context, Agricultural commercialization Cluster (ACC) may be a system that brings farmers along and produces an identical agricultural product on hand-picked ecology or farming field.[2]

The Agricultural Transformation Agency (ATA) that was established by the council of ministers of Ethiopia by regulation 198/2010 remains the one who is accountable to support the nine priority crop commodities value chains of focus within the ACC.[3] Beyond the nine commodities prioritized within the ACC throughout the rest of GTP II (2016-2020), the ATA continues to support teff, haricot bean and apiculture value chains in a more limited manner. The organization additionally aims to support alternative regionally-led crop clusters outside of the ACCs through sharing tools and ways that of operating with the regional bureau of Agricultures.

In Ethiopia, the Agricultural commercialization cluster (ACC) was started with the aim of commercializing smallholder Agricultural farmers for the contribution of different key Goals. These key goals are increasing the incomes of smallholder farmers, increasing industrialization, creating off-farm employment opportunities and increasing exports substitute imports and developed domestic market.[4]

So Siyadebrina wayu woreda was one of the woreda in Amhara region which was selected for the implementation of AC for the success of the above mentioned goals. Thus this study was focused mainly on contributions of cluster farming to the livelihood of the farmers, at Siyadebrina wayu woreda, North Shewa, Ethiopia.

[2] http://www.ata.gov.et/our-approach/agricultural-commercialization-clusters-2
[3] FEDERAL NEGARIT GAZETA, 17" Year No. 20 ADDIS ABABA l' March 2011
[4] https://www.ata.gov.et/our-approach/agricultural-commercialization-clusters-2/

1.2 Statement of the problem

As the study done in Southern and North Mindanao shows there are many issues and challenges related to ACC and these were the sustainability of financial support, difficulty in sustaining active farmer members, encouraging farmers to cooperate once they are in the cluster, and the need for more farmer leaders (Montiflor 2008:18) but even with these problems ACC brought a bigger change in increasing production. In general speaking there are so many factors/challenges/ that affect the contributions of cluster farming to the livelihood of the community which includes poor access to modern inputs and credit, poor infrastructure, inadequate access to markets, land and extension services (Bernard 2008:15).

The Ethiopian agriculture sector has remained embarrassed by different challenges. During the 2017/18 production year of the total 36 million hectares of agricultural land, only 13 million hectares which were around 35% was cultivated. Over 90% of farmers are smallholders cultivating one hectare or less land. Farming techniques have changed little over the centuries, yielding low outputs and making farmers vulnerable to the effects of unpredictable weather patterns.[5]

According to the Agricultural Transformation Agency (ATA) and Ministry of Agriculture and Rural Development's report which was cited in (Tagele 2018:32), the majority of the Ethiopian agriculture sector is owned by smallholder farmers who had less than two hectares of land. On the other hand productivity and production in Ethiopia are sensitive to climatic variation, land degradation, very limited/few/ household assets, low levels of farm technologies, lack of employment opportunities, and population pressure. Ethiopia gives due attention to transform its agriculture especially after the implementation of the Growth and Transformation plans (GTP I and II) by introducing different modern mechanisms to boost its productivity from year to year. Cluster Farming, also known as Agricultural commercialization cluster, which is playing a key role in increasing agricultural productivity of the country, is one of the methods which was introduced recently (MoA 2019).

[5] ATA annual report 2010, http://www.ata.gov.et/wp-content/uploads/2019/01/ATA_AnnualReport_2010.pdf

So far a total of 198 woredas in the whole part of the country were engaged in cluster farming with the support, follow up and supervision of ATA. Sine ACC boost production and productivity, by saving the cost and energy farmers spent before and by linking small holder farmers with the market, ministry of agriculture agreed to increase the number of woreda to be included with the cluster farming system from 198 to 450 and to share the follow up and support of these woredas with ATA[6].

On the same manner there are a lot of bottle neck problems for the proper implementation of the ACC in all parts of Ethiopia. According to (Berhanu 2006:23), the main challenges of the Ethiopian agricultural system, in general, are top-down, non-participatory and supply-driven extension services, low Staff morale, capacity and capability of the sector, high engagement of the Das in non-extension service activities, absence or shortage of mechanization services and market linkage, farmers hesitation to new technologies are among the many. On the other hand, according to the finding of (Tagele 2018:35), in the study that was done in Southern Ethiopia, Farm size had a positive relationship with technology adoption. This is because the probability of adopting a new technology is high for farmers with large farm size. According to DAG report (DAG 2017:2), Land was identified as one of the ongoing and future challenges of Ethiopian Agriculture. Landholdings farmers are becoming more and more fragmented with the shrinking of individual holdings. In some regions, the average holding may not be more than 0.5 hectares, which in turn highly restricts the use of modern farming practice and it can only be used for subsistence production. At the same time, much productive farmland has been taken over by industrial and urban expansion.

According to (Leykun and Jemma 2014:4) another challenge is the fact that the largest proportions of smallholder farmers of developing nations like Ethiopian farmers are mainly producers of staple food crops/grain. Commercializing grain needs special attention due to the fact that grain (example wheat, maize, teff etc. for Ethiopia) is a staple crop in most sub-Sahara African countries. So its market availability and price matters to the population both individually and collectively. Secondly, grain is produced seasonally but consumed daily. Thus it is a great concern and subject to market intervention. Grain is bulky, non-perishable and traded in large

[6] https://www.press.et/english/?p=8798#

volumes. It has a low unit cost but segregation with respect to quality is important in marketing. Grain is produced by large number of small-scale farmers; each producing a small part of the total quantity sold leaving them to be price takers. Other factors like low access and usage of mechanizations, low output, reduced access to land, very less access to inputs, low level of irrigation system, little access to know-how for risk management, technology, and skill, also have their own challenge for ACC (Guushe, 2017:8; Urgessa, 2013:11; Berhanu, 2006:6). Agricultural cluster in the woreda is conducted since 2014/15 and it has its own contributions for the livelihood of the farmers in the woreda, but still there are so many problems that hinder the contributions of cluster farming, these includes the problem of getting modern inputs on timely bases, problem of market linkage in selling the products of the farmers, problem related to availability and access of finance or capital in credit.

Therefore this study was aimed to examine the contributions of cluster farming to the livelihood of the community. As to the knowledge and reading of the researcher besides the report from the MoA and ATA, there is no as such a research conducted in the cluster farming system of Ethiopia. Thus this study investigates the contributions of cluster farming to the livelihood of farmers, at Siyadebrina wayu woreda, North Shewa, Ethiopia.

1.3 The objective of the study

1.3.1 General Objective

The overall general objective of this study was to examine the contributions of cluster farming to the livelihood of the farmers at Siyadebrina wayu woreda of North Shewa zone.

1.3.2 Specific objectives

2. To analyze the change in production per hectare as a result of cluster farming
3. To find whether Farmers involved in cluster farming have better credit access for purchasing inputs than farmers which are not involved in cluster farming.
4. To analyze the market linkage created for the cluster farming participants
5. To identify the contributions of cluster farming for the improvement of farmers.

1.4. Research questions

1. Is there a change in the amount of production per hectare of land in cluster farming than the usual farming system?
2. Do farmers involved in cluster farming have better access to get modern inputs?
3. Is there a market linkage created for farmers involved in cluster farming to sell their products?
4. What are the different contributions of cluster farming for the improvement of farmers' life?

1.5. Significance of the study

There are very limited research findings related to ACC in this country and, this research is assumed to help other researchers, by being a stepping stone for further researches and studies in cluster farming. Moreover, the recommendation which is given on the recommendation section of the paper will help to improve the implementation of cluster farming in Ethiopia in general and that of the Cluster farming in the woreda under study in Particular.

1.6. Limitation of the study

Since the topic under investigation, even the ACC is introduced recently in Ethiopia, it was difficult to get relevant reading materials for deeper insights. As to time and budget limitations all the kebeles in the woreda who practice cluster farming were not considered in the study. The methodology which is applied for studying the topic may lack to better explore the contributions of cluster farming and other research can use a better methodology and can make further study in the same area or in other areas.

1.7. Scope of the Study

This study was conducted at Siyadebrina Wayu woreda of North Shewa of Amhara region. The focus of the study was to see whether Cluster farming has contributions to the improvement of the livelihood of the farmers or not. The study was also focus to see the different factors that affect the implementation of cluster farming in the study area. The Study was conducted in one of the Kebele of the woreda with the involvement of farmers participated in cluster farming and farmers who didn't participated in cluster farming. Other kebeles in the woreda which are practicing cluster farming were not being part of the study.

1.8. Definition of terms and keywords.

- **Cluster**- Concentration of similar or interrelated activities/ industries in one geographical area with the purpose of exploitation of the advantages of the location.

- **Cluster farming**:-the agricultural system that brought farmers who have farmland adjacent to each other to produce in large scale by the application of modern farm inputs and frequent advisory services.
- **Smallholder farmers**- those farmers who own land less than two hectares per household and those farmers who have resource constraints such as capital, inputs, and technology.

- **Agriculture Commercialization**- the gradual transformation of the Agriculture from the production for self-consumption and interest to the level of production for sale in the market.
- **Center of excellence-** making one specific area to work/concentrate on specific /particular activities that are unique for that particular area and making that area a center of experience sharing and best practice.

1.9. Organization of the study

This study is organized into five chapters. The first chapter deals with introduction, which encompasses background, statement of the problem, research objectives, research questions, significance, scope, limitation of the study and definition of terms. The second chapter mainly focuses on review of related literature which covers, literature related to cluster farming and different empirical reviews and conceptual framework. The third chapter explains the research methods i.e., description of the study area, research design, data sources, data collection techniques and sampling methods, data analysis methods and ethical considerations. The fourth chapter deals with results and discussion. Finally, the last chapter, chapter five focuses on conclusion and recommendation which bases from the findings of the study.

UNIT TWO: REVIEW OF RELATED LITERATURE

2.1. The Concepts of Agricultural Commercialization

The concept and essence of agricultural commercialization can be complex, and it has contributed to varying definitions and emphases. According to (Pingali & Rosegrant 1995:13), Agricultural commercialization is more than marketing agricultural outputs. The Source further argued that agricultural commercialization is attained when household product choice and input use decisions are made based on the principles of maximizing profit.

Commercialization in agriculture also refers to the gradual and progressive transformation from household production for self-consumption and interest to production for sale in the market, (C. S. Kim etal 2016:45). On the other hand, smallholder commercialization refers to a good cycle in which farmers strengthen and increase their use of productivity by enhancing the use of technologies on their farms to get better output per unit of land and labor (T.S. Jayne 2011:11). Since the majority of the developing countries population depends on the agricultural sector, which is practiced on a small plot of land, Commercializing smallholder agriculture is a pathway towards economic growth and development (Pingali & Rosegrant 1995:22). Commercialization of farming is generally considered as the most effective means of solving the problem of the population who are with poverty in the developing world (Carletto, Corral and Guelfi 2017:31).

The government of Ethiopia introduced the concepts of Agricultural commercialization cluster (ACC) in 2014[7],with the concept of identifying a means through which geographically targeted interventions could be integrated to ensure rapid sustained and inclusive development of priority agricultural commodity value chains,

A lot of efforts were done by the government of Ethiopia as well as the ATA, who was established to transform the Agriculture of Ethiopia by introducing the concepts of ACC and by identifying different woredas in Tigray, Amhara, Oromia and SNNPR regions of the country. The intention of the identified ACC woredas' was to act as a center of Excellence (CoE), where the regions was supported to maximize production and productivity by integrating

[7] https://www.ata.gov.et/our-approach/agricultural-commercialization-clusters-2/

commercialization activities. These clusters are therefore meant to serve as models for learning as Ethiopia intensifies the ACC approach and scales up best practice across the county. Correspondingly, different regions in the country have begun to duplicate the model across other similar geographies and commodities.[8]

2.2. The Concepts of Agricultural Cluster

The word cluster is defined by different authors in different ways but the general concept is almost the same. As a simple definition, a cluster is defined as the concentration of industries in one geographical area with the purpose of exploitation of the advantages of the location. For example in India, Maharashtra grape cluster, cluster was defined with the concepts of the coming being of producers and agribusinesses institutions of the same sector that address and share common challenges and opportunities in one area (Bosworth and Broun, 1996:7). On the other hand, Michael defines a cluster as follows, "a cluster is a geographically proximate group of interconnected companies and associated institutions in a particular field, linked by commonalities and complementarities" (Michael, 2000:24).

The agricultural commercialization cluster aims to commercialize smallholder agriculture to contribute to four key Goals. These key four goals drafted by the ACC were

1. Increase incomes of smallholder farmers.
2. Increase exports, substitute imports and developed domestic market.
3. Increased industrialization.
4. Create off-farm employment opportunities.

The three Key ACC drivers to achieve the above mentioned goals of the ACC are

1. Increased farm productivity through.
    - ❖ Timely and easy access to quality input(Seeds, fertilizers, finance, technological inputs, irrigation)

[8] https://www.ata.gov.et/our-approach/agricultural-commercialization-clusters-2/

- ❖ Reduction in post-harvest loss with developed storage facilities and use of technology.
- ❖ Economies of scale at play for input distribution and output aggregation.

2. Enhanced Production Competitiveness.
   - ❖ Improved quality of output and declining cost of production with easy and timely access to quality inputs.
   - ❖ Market driven output production.
3. Improved linkages amongst value chain (VC) actors with greater role of private sector.
   - ❖ Direct market linkages like out-grower schemes, VC alliances, enablers (market information, quality Standards)
   - ❖ Favorable environment for private sector to invest in value addition, inputs development and supply, distribution.
   - ❖ Investments expanding the employment, capacity- building and training opportunities.[9]

Since many developing countries, relies on agriculture, the greatest potential for their sustainable growth is in the agricultural sector. But on the contrary, it is the agricultural sector where poverty is most widespread and found in its worst forms. Smallholder farmers and the rural communities in which they live are confined within a "cycle of equilibrium" of low margins, resulting in low risk-taking ability and low investment, which leads to the happening of low yield, low market positioning and less-value addition which, resulted in, low margins (ITC 2006:7).

So there should be some effort to be performed to take out the agricultural sector as well as the smallholder farmers who mostly engaged in subsistence farming from this cycle of poverty. Though the change is not as such very significant, the government of Ethiopia gives a due attention to support the smallholder farmers to take out them from subsistence farming system.

Like that of the developing world, there is no clearly stated and agreed definition of what constitutes a small farm in Ethiopia. However, it is well known that small holder farmers in Ethiopia account for most of the Ethiopian population and the production of food grain (Betre 2006:54). In Ethiopia, of the total cultivated cropped land, about 95 % is cultivated by these

[9] agriprofocus.com/upload/ATA_ACC_Briefing_-APF14456959201451055638.pdf

small holder farmers which also account 90 % of the total agricultural output. According to the source from CSA, the average landholding size of smallholders in Ethiopia is 1.18 hectares per farm household (CSA 2008:17). Ethiopia meets the conventional meaning of small farms (less than two hectares per household). Even far beyond the size of the farm, the smallholders in Ethiopia are known for their resource constraints such as capital, inputs, and technology. They are heavily dependence on household labor; subsistence orientation; and exposed to risks like reduced yields, crop failure and low prices (Betre 2006:54 and Mahelet, 2007:25).

Another source also concludes as Ethiopia is a country of smallholder agriculture because population pressure has diminished households' farm size. The question of farm size is related to the degree to which the size of landholdings can adequately support the livelihood of the farmers and a sustainable intensification of agricultural production (Menberu 2014:157). A number of researchers like (Gebresellassie, S. 2006); EEC/EEPRI 2002) have raised the issue of the gradual conversion of Ethiopian agriculture from small-scale agriculture to micro-agriculture that cannot reduce the poverty of the farmers and even unable to support the life of the farming community. Farm size in all the sample households range from zero (landless) to a high of 5 hectares although those who own the latter are very small in number and usually reside in the less densely populated regions of Somali and Afar. The average landholding size for all the households is about 1.02 hectares per household and this average declines slightly to about 0.96 hectares when we take out the samples from sparsely populated regions of Somali, Afar and Benishangul-Gumuz (EEC/EEPRI 2002).

In the 2000 cropping season, 87.4 % of rural households operated less than 2 hectares; whereas 64.5% of them cultivated farms less than one hectare; while 40.6% operated land sizes of 0.5 hectare and less. Such small farms are fragmented on average into 2 to 3 plots. On the other hand, other source, Gabriel (2000), explains, about 92.26% of rural households in Ethiopia operate on holdings of mean 1.4 ha which constitutes 72% of total crop area. The number of households operating on holdings smaller than or equal to 1 ha (mean 0.73 ha) constitutes 72.1% of the total while the national average holdings estimate is about 0.8 ha.

So the creation of "value networks" is the most effective means which helps to break poverty of the small landholders which will help them to raise prospects on long term competitiveness within the agricultural sector. A value network is an aggregation of:

- vertical relationships among suppliers of raw materials and production inputs, agricultural producers, processors and exporters, buyers and retailers;
- horizontal relationships among producers, which take the form of growers' cooperatives or various types of smallholder business consortia;
- support relationships between producers and facilitating organizations (e.g. local governments, business service providers, research institutes, universities, and non-government service organizations) that reinforce the quality, efficiency and sustainability aspects of the chain (ITC 2006b:33).

5.1 Effect of Agriculture on Environment

The ever-growing of the world population which in turn brought a high demand for food, fuel, and fiber increase the demand of the world population for high demands on agricultural lands, (Bommarco et al 2013:37). With this high increasing world population, the agricultural land not only occupies 5 billion hectares of the land surface but also increases by 13 million hectares annually (FAO 2002:62).

Within a century and a half, that ranges from the mid-nineteenth century to the middle of the 1990s human being converted almost 1 billion hectares of forests, grasslands, and wetlands to farmlands (Hawken et al 1999:37). The intensification of agriculture as a result of the use of modern inputs such as chemicals and machinery has a major impact on local as well as the global environment. The common resources used in agricultural practice are Soil, air, and biodiversity. So any environmental impact which happened in agriculture highly affects these resources.

As it was explained in the document millennium Ecosystem Assessment (2005:15-16) the main negative effects/impacts of agriculture on land and freshwater includes, the changing of forests, grasslands and other lands to agricultural land, degradation of soil fertility and quality, pollution of soil and surface water, aquifers and coastal wetlands through excessive use of pesticides and fertilizers..

The environmental impacts of agriculture are not the same in different areas. Its negative impact may vary based on the location of the farm, the type of farm, and the farming and land

management practices used and the timing of the practices. For example, if the application of fertilizers on the farm is during rain hours, some of the toxic chemicals may be taken into the water by runoff and affect both the surface water and the groundwater by percolation (Michalak et al 2013:6, Schindler et al 2012:11).

So environment should be taken in to consideration while practicing agriculture. Once the environment is highly affected production may not be possible. Especially when we practice cluster farming by the use of modern inputs there should be a proper care to minimize the effect of the fertilizers by the local community and farmers. Those who are practicing this should also be advice to allocate a certain amount of resources to properly regenerate the local environment for their sustainable use.

2.4. Review of Empirical studies.

2.4.1 Factors that Determinates the participation of farmers in Cluster farming

According to (Dorsey 1999) which was cited by (Abdullah 2017:42) there were approximately 2 billion people which rely for their livelihoods on 500 million smallholder farms in the whole world. The same source also explains of the total food consumed in Asia and sub-Sahara Africa, 80% is produced by these small farms. Most of these smallholder farmers focus on a subsistence level of production in which they produce only for self-consumption.

As source indicates the issue of commercialization of smallholder farmers, especially in developing countries, could have a positive impact on performance and on livelihood generation, (Muriithi and Matz 2014:85). Even though the commercialization that is implemented on smallholder farmers land, with the support of the government has a positive impact on the life of the smallholders' there are various factors that determine the participation of the farmers in cluster farming.

2.4.1.1 Farmers' awareness level.

Education that helps for the creation of awareness for the farmers is the most important factors that highly determine the willingness of an individual either to accept or reject new ideas and innovation. As it was explained by Feder & Slade in 1984) which was cited (Bethuel K. K. & Edward Mabaya 2015:15) argue that farmers with more education have more knowledge of improved agricultural technology and are therefore more willing and more likely to apply technology in their farming faster than the uneducated or less educated once.

In a study that was done in Nepal (Pudasaini1983:41) on the effects of education on agriculture, it was found that, education level of farmers used to improve agricultural productivity primarily by improving farmers' decision-making ability and by alleviating their technical efficiency, which means education helps farmers capability to make better choices in terms of input and make better economically rational decisions.

So the education level of the farmers has a direct impact on the awareness level of the farmers in accepting or rejects a new technology. If farmers have better education level which in turn increases the level of awareness, they can easily accept and adopt the cluster farming approach and started to implement it.

2.4.1.2 **Market efficiency**.

An efficient marketing system ensures higher levels of income for the farmers by reducing the number of middlemen or by restricting the commission on marketing services and the misuses adopted by them in the marketing of farm products. An efficient system guarantees the farmers better prices for farm products and induces them to invest their surpluses in the purchase of modern inputs so that productivity and production may increase (Acharya S.S and Agrawal NL, 2006:65)

An efficient agricultural marketing system leads to the optimization of resource use and output management. An efficient marketing system can also contribute to an increase in the marketable

surplus by scaling down the losses arising out of inefficient processing, storage and transportation (Mamoria, C.B. and Joshi. R L1995:72).

During the visit by the former Prime Minister of Ethiopia, Haile Mariam Dessalagen and the higher government officials' that was done in December 2017 at the woreda under study farmers were expressing their problem related to market linkage with the production of large amount of products. In the interview with the journalist one of the farmers express the issue as follows:

> *"… the other problem was absence of market linkage. This is because we grow wheat seed called 'Dendewa'. Since we did all agricultural activities as per the lesson we took, we will expect satisfactory yield. But now we are thinking mostly to have surplus production, however the price of wheat may fall down"*[10]

According to the same source the then, North shewa zone agriculture district head explained as wheat is the one among the crops that faced problems related to market. During the 2015/16 production season, the price of wheat was down to 600 Birr per quintal. Thus, without adding some value, selling such products is not profitable. On the other hand the study done in SNNPR, Konta special woreda, (Tesfaye 2016:35) explains as market actors were facing increasing marketing inefficiency in the local market

2.4.1.3 Infrastructure.

Rural infrastructure development can boost national, regional and international economic development. On the other hand the development of rural infrastructure is highly related to Agricultural production. Besides providing essential agricultural production conditions such as roads, telecommunications, powers and irrigation system, rural infrastructure also provides education and medical services related to enhancing the quality of rural labors such as cultural and educational facilities, vocational/technical schools, and medical institutes etc (Zongzhang and Xiaomin 2009:6)

The critical bottleneck for the future growth and development in agricultural and economic output and poverty alleviation in developing countries is the failure to invest in rural

[10] https://expogr.com/ethiopia/foodexpo/detail_news.php?newsid=4339&pageid=2

infrastructure development. Indeed, severe rural infrastructure deficiencies undermine the huge potential of the agriculture sector in developing countries to contribute to growth and poverty reduction. Improved rural infrastructure will reduce poverty through improved agricultural productivity and through improved wages and non-farm employment (Fan, Hazell and Thorat (2000:16).

The effects of infrastructure put emphasis on the process of commercialization in agriculture and rural sector (Jaffee and Morton 1995:23). On the other hand, (Fan 1998:32) showed that rural infrastructure is not only an important driver for total factor productivity growth, but also directly contributes to a substantial reduction in rural poverty. As the study done in India showed, if the Government were to increase its investments in roads by 100 billion, the incidence of poverty would be reduced by 0.87% and the factors of productivity would increase by 3.03%. Similarly, investment in agricultural research and extension would contribute to 6.08% growth in total factors of production 0.48% reduction in rural poverty (Fan 1998:32)

As the study done in Philippines (Manalili and Gonzales 2009:14) indicated that good road infrastructure and irrigation facilities improve farm profitability and productivity. They point out that nitrogen fertilizer, pesticides, and irrigation are positively correlated with yield and significantly affect it. But road structure affects the price of urea fertilizer, which is more expensive in areas with poor roads owing to higher transportation costs incurred in the purchase of this input. Farmers tend to apply more nitrogen fertilizer because of the lower price brought about by lower transportation costs.

Improved infrastructure leads to expansion of markets, economies of scale and improvement in factor market operations. It also opens up the rural economy to greater competition from outside. This may take the form of cheaper products from lower-cost sources of supply or new or improved products that may displace some locally produced items. The majority of studies recognize that infrastructure investment has a strong impact on rural incomes and especially on small holder.

Farmers of the woreda express their dissatisfaction on the infrastructure problem to the then prime minster of Ethiopia, Haile Mariam Dessalagen and Higher government officials while they

were at the visit of the wheat cluster in the woreda understudy in December 2017[11] . Some farmer even told the officials as they were making more money and they need entrepreneurship access. Some farmers also expressed their intentions to buy cars for taxi services, to build hotels and restaurants but there is no asphalt road, no water, and electric access. Even if there is electricity in some kebeles, a frequent power interruption is a big problem. The farmers were also explained as there is no access to mechanization machines.[12]

All these problems fall under the absence of or inappropriateness of infrastructure in the area that have their negative effect on the implementation of cluster farming.

2.4.1.4 Capital or Finance sources

The degree of access to finance credit remains a major challenge for smallholder farmers in most developing countries. The problem frequently is seen in terms of limited access to production credit to buy and use farm inputs as well as pay for non-family farm labor and other farm maintenance costs. Because smallholder farmers cannot afford yield-enhancing inputs, farm productivity often remains low on smallholder farms despite available technology for achieving higher yields (Onumah and Meijerink, 2011:19).

In Africa in general and Ethiopia in particular, agriculture is yet the main sector of the economy in which the formal financial sector is not noticeably successful in delivering financial services to farmers in need. In the continent, finance for agriculture and the rural economy in general is unable to meet the rising demand. Inherent difficulties, risks, and costs impede the effectiveness of finance in each of these areas (Honohan and Beck 2007:33).

As it was stated in (Tilahun 2015:14-16), some of the reasons why the financial system fails to meet the demand of the agricultural sector include, seasonality with longer gestation period, exposure to systematic risks, limited collateral, higher transaction costs and banks competing priorities.

[11] https://expogr.com/ethiopia/foodexpo/detail_news.php?newsid=4339&pageid=2
[12] https://allafrica.com/stories/201712150370.html

As to the study that was done in Merit and Adamitullu Jido Kombolcha districts in Oromia regional state of Ethiopia (Komicha 2007:19), credit constraint status of households is defined broadly across all types of credit suppliers. The study also explained the impact of credit constraints on technical efficiency of farmers and uncovered a 12 percent efficiency gap between constrained and unconstrained households.

By understanding the problem of financial access to the rural community, with the implementation of the cluster farming system ATA, introduced the input voucher system (IVS). The IVS was formulated in response to the difficulties that smallholder farmers face in accessing credit for agricultural inputs such as fertilizer, improved seeds, and labor-saving tools, all of which are essential to increasing production and productivity in a sustainable manner. The system engages local microfinance institutions (MFIs) or rural saving and credit cooperatives to qualify farmers for loans and issue cash or credit vouchers that can be used to redeem inputs at nearby cooperative stores. By doing so, it minimizes the risk that farmers will be prevented from using inputs because of their high initial costs. While other factors certainly play a role in influencing the adoption of new inputs, facilitating credit access is a proven means to encourage farmers to experiment with and use improved technologies.[13]

The initiative in piloting the IVS was started in 2014 in five woredas of the Amhara region, in collaboration with the Amhara credit and saving institution (ACSI), which opened 55 new branches for this purpose. During the pilot period, vouchers which worth of 243 million ETB were issued to 168,000 farmers who either paid cash or accessed the vouchers on credit. Before the end of the 12 month loan period, a worth of over 52 Million ETB vouchers was accessed by the 35,000 farmers as a credit and all of them had repaid their debts in full. The newly established ACSI branches mobilized more than 35 million ETB in savings from over 24,000 farmers in the pilot woredas within the same time frame. Towards this end, 219 ACSI and primary cooperative staffs were trained on IVS implementation. Following these remarkable results, the IVS was rapidly scaled up in Amhara, SNNP, and Tigray.[14]

[13] http://www.ata.gov.et/programs/highlighted-deliverables/input-voucher-sales-system-ivs-2/
[14] http://www.ata.gov.et/programs/highlighted-deliverables/input-voucher-sales-system-ivs-2/

2.4.1.5 Mechanizations

Many scholars can define mechanization in different ways, but as it was cited in (Clarke Clarke 1997), FAO defines mechanization as "the application of tools, implements and machinery in order to achieve agricultural production." These tools and machineries can all be operated by manual, animal or engine by the use of fossil fuel or electric power. Essentially, agricultural mechanization represents technological change through the adoption of non-human sources of power to undertake agricultural operations. Mechanized agricultural operations can be grouped into power and control intensive functions. Mechanization of power intensive agricultural operations, such as land preparation, threshing, grinding and milling, is characterized by non-human sources of energy input to replace human and animal ones required in the operations. On the other hand, mechanized control intensive operations, such as planting, weeding, winnowing, fruit harvesting, require greater human judgment and mental input in addition to energy (Pingali 2007:27).

As it was explained Pingali, (2007:31), of all the continents, African farming systems remain the least mechanized and 70% of the farmers cultivate parcels of less than two hectares by hand hoe. Other, estimates from the Food and Agricultural Organization (FAO) show that Africa has less than two tractors per 1000 ha of arable land. In 2012, average tractor use in Sub-Saharan Africa was around 1.3 per 1000 hectares of cultivated land, compared to around 9.1 in South Asia and 10.4 tractors in Latin America (FAO 2012:9). Tractor use in sub-saharan Africa peaked at 1.9 per 1000 hectares in 1986 and has gradually declined since then (FAO, 2011:4); FAO, 2012:10). Several factors have been attributed to limit mechanization and to hinder government and private sector investment in mechanization among smallholder farmers in Africa. They include

I. thin markets that limit access to machinery and spare-parts supplies,
II. missing institutions especially those that would be required to ensure adequate technicians and skilled personnel to operate and repair farm machinery,
III. governance challenges such as political interest, elite capture, ineptness and corruption that constraint the government and hinders private sector's involvement in machinery importation.

According to the Ethiopian National Agricultural Mechanization Strategy (2014) the usage of mechanization in Ethiopia in the Agriculture sector is by far less than other African countries due to several reasons, the major once are the following,

I. Lack of an overarching, comprehensive agricultural mechanization policy and strategy; and institutional capacity.
II. Purely physical, this is that the land size and topography in Ethiopia is limiting to increase in agricultural productivity through increased mechanization.
III. Lack of physical machinery available; both from domestic or international sources.
IV. Farmer behavior and perception/lack of awareness of agricultural machinery.

As the study done in the use of mechanization in Ethiopia (Guushe 2017:11) there is a range of differences in mechanization across zones in Ethiopia based on farm activities (i.e. plowing and threshing) and the size of farms. In land preparation, an average 78.8 percent of plots were prepared by animals, compared to 0.7 percent prepared by machine; and with threshing, almost 50 percent of plots were worked manually, 47.9 percent with animals, and only 0.8 by machines. In addition, the research explored mechanization of different crop types, finding wheat as the dominant crop in which machinery is used in Ethiopia, though still low compared to Africa as a whole.[15]

The same is true in the use of mechanization with other areas of Africa and other parts of Ethiopia in the use of mechanization for farming activities in the woreda under study. According to the information from the woreda office of Agriculture, in the woreda under study, mechanization in the study woreda is commenced during the production year of 2018/19 by a very few farmers. According to the source from the woreda office of Agriculture, by 2018/19 production year the woreda was planned to prepare 815.75 hectares of land by making awareness for a total of 1631 farmers to use the machine. But it was only 608 (37.2%) of the farmers who were registered to use the machine to plow their 303.38 hectares of land. But at last it was only 317 (49.9%) of the registered farmers who were using the machine to plow their 121.3 hectares of land.

[15] http://essp.ifpri.info/2017/02/28/the-rapid-uptake-of-agricultural-mechanization-in-ethiopia-patterns-implications-and-challenges/

2.5 The Contributions of Cluster farming.

Clustering is a tool used in many countries to group producers with similar interests and/or commonalities to benefit from positive outcomes associated with group marketing, access to finance, and economies of scale.[16]

As the study conducted in South Africa on cluster farming (Mpho 2015:7) the following were identified as the contributions of cluster farming.

I. The presence of supporting institutions within the cluster.
II. There were high increases in accessing market information.
III. There were possibilities of increasing innovation within the cluster.
IV. Smallholder farmers were encouraged to add value on their production and to conduct market-oriented production.
V. Small Scale farmers were able to full fill the high standards set by their importing markets.

On the other hand, the study that was conducted in china realized the following as the contributions of Agricultural cluster (Pingu.L and Waldemar Kozolo 2011:15)

I. Agricultural cluster helps farmers to advance and specialize in agricultural production and also increase the incomes of the farmers.
II. Agricultural cluster is also found promoting competition among different strength of enterprises in the cluster.
III. Agricultural cluster strengthen the development of regional economies.

In the production year of 2016/17 with the implementation of ACC[17], crop productivity at Siyadebrina wayu woreda has increased by 32 quintals per hectare, which was higher than the average national production by eight quintals. In the same manner by the evaluation and assessment of ATA productivity per hectare averagely increased from 22 quintals to 36 quintals in smallholder farmers on selected crops. In some Kebeles' of Siyadebrina wayu woreda like

[16] https://blog.gfar.net/2016/04/08/is-clustering-a-game-changer-for-reducing-the-riskiness-of-farming/
[17] https://allafrica.com/stories/201712150370.html

Siyadebr and Ajersa Qubete kebeles; during the production year of 2016/17 production was increased from eight to sixty-four quintals per hectare.

Besides the increase in production, the evaluation and assessment of ATA also indicates as the implementation of ACC also increased the accessibility of crops produced by the smaller holder farmers to the market. Before ACC it was only 29% of produced crops of smallholder farmers that were delivered to market but after the implementation, it scaled up to 56%. On the same manner, according to the study that was done in Southern Philippines on the benefit of cluster framing, the result shows as the average monthly income of farmers which were participated in cluster farming was increased. For example their income before they joining the cluster was PhP 16,283, but after their involvement in it, it increased to PhP 23,041.[18]

According to (Eva Gálvez-Nogales 2010:11) clustering in the agricultural sector presents many benefits, such as creating an enabling environment for inter firm cooperation, facilitating the diffusion of innovations, and acting as a means to efficiently channel public support to increase competitiveness in the agricultural sector. Farmers and small-scale firms can benefit from participating in ACs, as they enjoy evident joint-action advantages and agglomeration economies. The source further highlights that collective action undertaken by cluster participants is the cornerstone of ACs, and describes the complementary roles played by the government, private sector (especially farmers, industry and inter professional associations) and academic, and research institutions in the development of agricultural clusters (Eva Gálvez-Nogales 2010:11)

As the same source (Eva Gálvez-Nogales (2010:11) explained that cluster farming provided numerous other benefits including high or better market prices, clearer and better market opportunities, marketing assistance, financial support and access to production inputs. Through cluster farming, farmers realized higher and more stable prices compared to what they received from the trader.

[18] Socio-Economic Impacts of cluster farming for small holder farmers in southern Philippines. Page 196

2.6 Conceptual frameworks

As it can be seen in the below conceptual frame work figure 2.1, the availability and access of farmers for capital or finance either by saving their own or by accessing from credit institutions can affect their participation in cluster farming. The Access of farmers to Education has its own impact on their awareness level. Because their being educated has its own impact on their willingness to accept new technologies which again has its own effect on cluster farming. In addition market efficiency which is strengthened by fair price and networking has also its own effect in the participation of farmers in cluster farming. On the other hand the availability of technology, modern inputs and mechanizations for farmers and the possibilities of accessing them either in cash or credit, or accessing the farmers for credit that will help them to buy the required modern inputs have effect on their participation in cluster farming. Availability of different infrastructures and the access of farmers for them have also its own effect on cluster farming.

Generally the conceptual frame work clearly explains or depicts as cluster farming is affected by related factors like capital or finance, awareness level of farmers, market efficiency, mechanization and infrastructure as well as the availability and access of farmers for them.

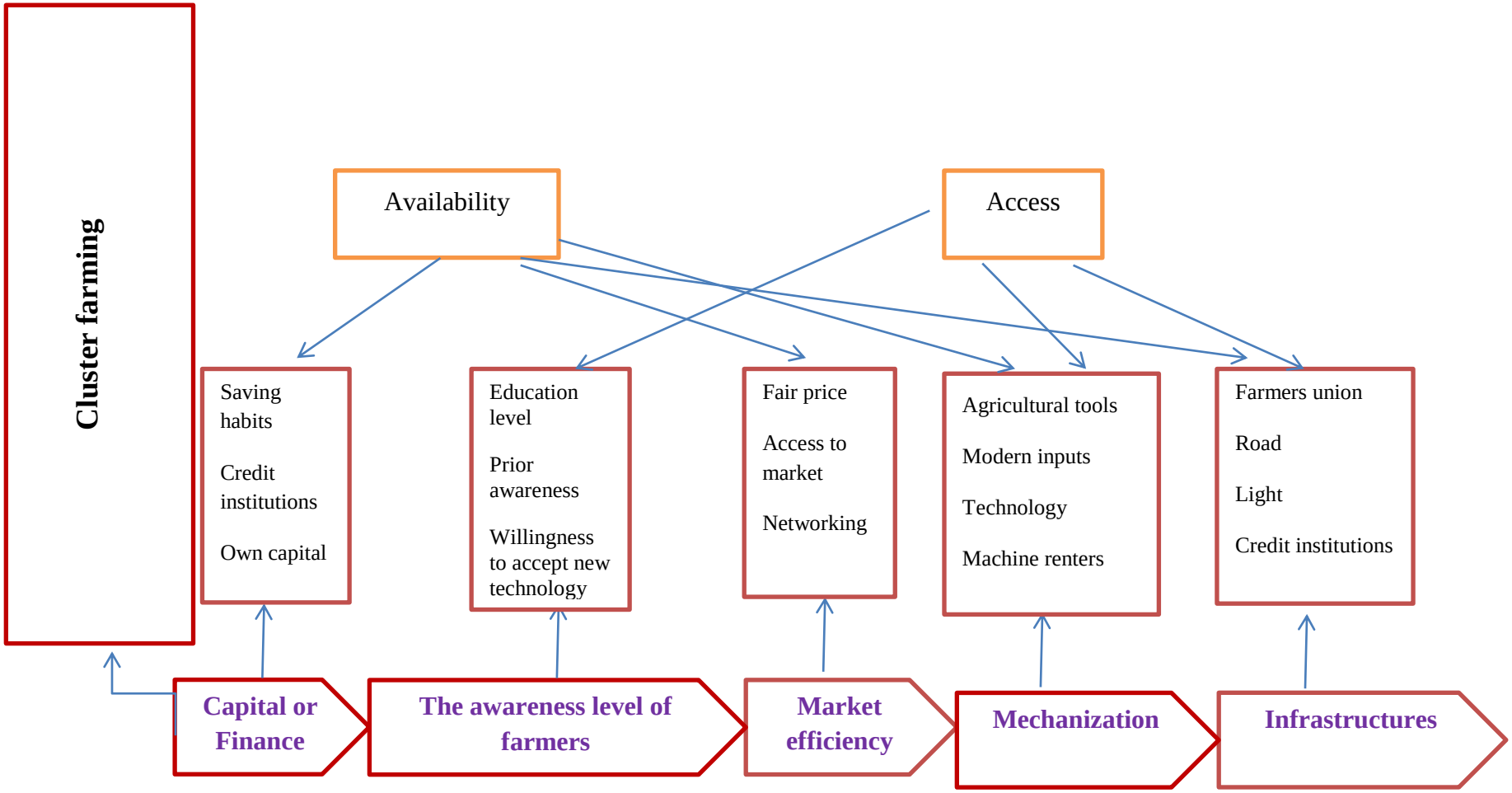


Fig. 2.1 Conceptual framework/ own construction, Sep.2019

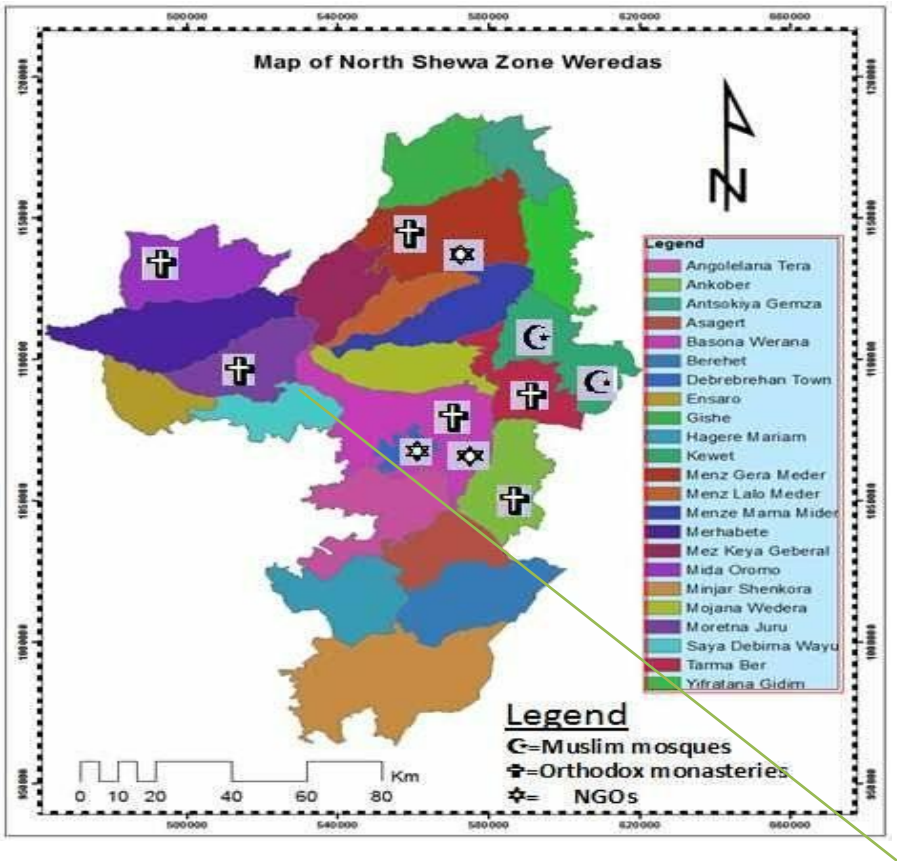
UNIT THREE: RESEARCH METHODOLOGY, MATERIALS, AND PROCEDURES

3.1 Description of the study area.

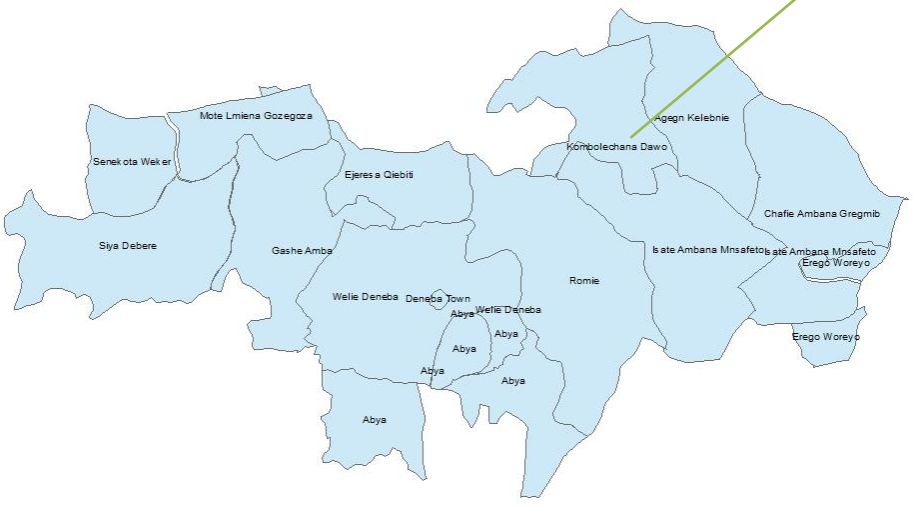
3.1.1 Location and Boundaries.

Siyadebrina wayu woreda is one of the woreda in the Amhara region of Ethiopia which is located in North Shewa zone. Siyadebrina wayu is adjoined on the south by the oromia region, on the west by Ensaro woreda of Amhara region, on the North by Moretina Jiru woreda of Amhara region, and on the East by Basona Werna woreda of Amhara region. The woreda capital is Deneba which approximately 45 Km away from the zone capital Deber Berhan and 129 Km from Addis Ababa via the shortest distance.

Fig. 3.2 Location of the study woreda in the zone map and the specific kebele in the woreda map.



Location of the study area



3.1.2 Population

Based on the 2007 national census conducted by the central statistical agency of Ethiopia (CSA 2007) the total population of the woreda was 61,046, of whom 31,322 (51.30%) were Males and 29,724(48.70%) were Females. About 4,522 or 7.41% were urban inhabitants and the remaining 92.59% were living in the rural kebeles of the woreda. But According to the information from the woreda office of agriculture, the total population of the woreda by 2015 reached, 70,594 of which 38,651(54.75%) were Males and 31,943(45.25%) were Females. Of the total population which was living in an urban area of the woreda, in the same year were 6,550(9.27%) of which 3,505 were Males and 3,045 were Females. The woreda is composed of 13 rural kebeles and one town kebele.

According to the same source from the woreda office of agriculture, the total area of the woreda is 46,528.4 hectares, of which 25,788.4 hectares is agricultural land, 5,585.7 hectares is grazing land, 1,662 hectares is forest land and the remaining 14,092.3 hectares is used for other purposes or it may not be suitable for any activity. In terms of climatic condition, the average rainfall of the woreda is 900 mm and 83% of the woreda is within the Dega Agro-climatic zone, 15% of the woreda is weina dega and the reaming 2% is within Kolla Agro-climatic Zone. The highest place in the woreda is 2600 meter above sea level and the lowest is 2033 meter above sea level. 85% of the soil of the woreda is black, 10% Loam and 5% sandy soil. 75% of the land feature of the woreda is flat land, 10% of the land is steep slope, 2% of the land is Mountainous and other land features account 13% of the woreda total area.

3.1.3 Agricultural practice in the woreda.

In all the 13 rural kebeles of the woreda, there is Farmer training center/FTC/ that provides extension service to the farmers in the kebeles. In terms of crop production in all of the 13 kebeles, there is a production of crops. In the production year of 2018/19, in terms of area coverage, cereal crops like wheat, teff, and barley cover 17,185 (78.87%) hectares of land. Of the cereals, wheat accounts 9,790 (45 %), hectares followed by teff, 5,258.75 (24%) hectares and barley 278 (1.27%) hectares. Crops like Bean, Pea, Chickpeas, and Lentils are also produced and they account 24.39% hectares of land. Sorghum and oilseeds are also crops produced in the area

and they account 4.24% of the production and 0.004 % of the area. There is also horticultural crop production in the woreda.

During production year, wheat farming is practices in eight kebeles of the woreda by cluster farming approach. In terms of modern technology/ agricultural input usage, 84,793 m^3 of compost was used on the 3391.72 hectares of land. Fertilizers like NPSB 24,357 quintals, NPSZnB 14,380 quintals, and Urea 42,706 quintals were also used. In terms of improved seeds, 2,640 quintals were supplied by improved seed production agency and all the seeds were distributed to the farmers. In addition to the improved seed supplied by the agency a total of 10,580 quintals of improved seed were also used by purchasing and by separating using local technologies. The major improved seed distributers in the woreda were Amhara seed enterprise, Tegulate union and Wedera Union. Weeding in the woreda is also supported by chemicals. Since 2012/13 the woreda use a chemical called Palace herbicide. By the production year of 2018/19 a total of 10,818 hectare of land of wheat and teff were using palace herbicides to protect the crop from herbs. A total of 5,824.6 liter of Palace, Topik and 2-4D were used for weeding purpose. The cluster farmers in the woreda also use a total of 4200 kg powder herbicide.

Table 3.1 Land Classified for wheat cluster in Selected Kebeles of the woreda.

Name of the Kebeles	**Total land wheat cluster(H)**	**Remark**
Romeye	314	
Egersa	150	
Esate Amba	139	
Dawo Kombolcha	114	
Agene kelebene	85	
Woleye	80	
Sayidebre	180	
Gashu Amba	65	

Mechanization was commenced in the woreda during the production year of 2018/19. By this year the woreda was planned to prepare 815.75 hectares of land by creating awareness for a total of 1631 farmers to use machine. But it was only 317 farmers who were using the machine to plow their 121.3 hectares of land. In the woreda, wheat cluster is practiced by a total of 140 clusters with total land areas of 8,813.425 hectares of land, and the total farmers participated were 8615.i.e 7593 Male and 1022 female farmers.

Table 3.2 Total Improved Seed Supplied and the suppliers companies.

	Amhara Seed Enterprise		Tegulate union		Wedera union	
Production year	2018/19	2019/20	2018/19	2019/20	2018/19	2019/20
Distributed improved seed (Q)	554	650	249	165.9	439.5	276.6
Land used the improved seeds(H)	379.5	418.25	416.5	274.38	630	415.37
Number of farmers who get the improved seeds from each suppliers,						
Male	688	681	276	535	351	596
Female	52	62	18	24	46	66
Total	740	743	297	559	397	662

Source: - (Woreda Office of Agriculture)

3.2 Research Methodology

3.2.1 Research Design

This study was carried out on selected farmers who practice cluster farming and who didn't practice cluster farming at Dawo kombolcha kebele of Siyadebrina wayu woreda of North Shewa zone. The study is designed as the cross-sectional design for the quantitative study which was used to gather the relevant and pertinent information with regard to contributions of cluster farming to the livelihood of the farmers in the study woreda. Cross sectional design was selected because the design is used to study different groups at one time and can be used to describe the characteristics that exist in a group by gathering relevant information about the study participants.

3.2.2 Population and Sampling Procedures

Since the purpose of this study was to conduct the contributions of cluster farming to the livelihood of the farmers by comparing the participants and non-participants farmers, at Siyadebrina wayu woreda, the target population of this study was both farmers who practice cluster farming and those who didn't practice it /BAU/. As per the information obtained from the woreda office of agriculture cluster farming has been practiced in eight of the kebeles at various degree of implementation. On the other hand there are also farmers who didn't yet practice cluster farming.

The study woreda was selected by using purposive sampling. I.e. Even though there were different woredas who were applying cluster farming both in the country and regional level, in terms of its distance, the woreda was selected purposely by using purposive sampling technique. In the same way the study kebele in the woreda was selected by purposive sampling. Since there are farmers who practice cluster farming and who didn't practiced, the two groups of respondents were selected by simple random sampling. After accessing the lists of the farmers from the kebele, the names of both cluster participants' farmers and BAU farmers were arranged alphabetically then sample farmers were selected by a lottery system.

According to the data from the kebele manager and the kebele level DA the total number of house hold of the kebele is 1992 of which, 1781 farmers are involved in cluster farming and the reaming 211 are non -cluster farming participant house hold farmers /BAU/. Since most famers are getting awareness and saw the better agricultural products of the early participant farmers larger number of the farmers is involved in cluster farming. So to determine the sample size Cochran's formula was used.

$$n_o = \frac{z^2pq}{d^2} \qquad\qquad n = \frac{n_0}{1+\frac{n_{0-1}}{N}}$$

Where;

n_o =the desired sample size.

n = number of sample size.

z=is 95% confidence limit i.e. 1.96

P = 0.1 (proportion of the population to be included in the sample i.e. 10%)

q = 1-p i.e. (0.9)

N= is total number of population

d =is margin of error or degree of accuracy desired (0.05)

Using this formula, the sample size was calculated as n_o= (1.962) ∗0.1∗0.9 (0.05²) =138

$$n_o = \frac{(1.96^2) * 0.1 * 0.9}{(0.05^2)}$$

$$=138$$

The sample size n was calculated for the two groups as;

$$n(CFP) = \frac{138}{1+\frac{138-1}{1781}} \approx 130$$

$$n(BAU) = = \frac{138}{1+\frac{138-1}{221}} \approx 80$$

So the total simple sizes of the research for the two groups of respondents were 210 households.

Table 3.3. Categories of respondents, sample size, sampling technique, and percentage.

No	Types of Population	Total population	Sample size	Sampling Techniques
1.	Number of Farmers who practice cluster farming.	1781	130	Simple random sampling
2.	Number of Farmers who didn't practice cluster farming	211	80	Simple random sampling
3.	Crop production Developmental agent of the selected Kebele's	1	1	Purposive sampling
4.	Woreda level Experts	4	2	Purposive and simple random sampling

3.2.3 Data Collection Tools and Procedures.

Both primary and secondary data sources were used in the study. The primary data was collected from study participants' farmers, BAU framers, developmental agents and woreda bureau of agriculture experts by using questionnaires, FGD, interviews, and observation. A total of 23 opened ended and 16 close ended questions were distributed for the sampled 130 cluster farming participants' farmers and a total of 22 opened ended and 13 close ended questions were distributed for 80 BAU farmers. Two woreda level crop experts and one kebele level DA were interviewed. A total 6 FGDs was held with the cluster farming participants' farmers each containing 8 and 9 attendants and 4 FGDs were also held with the BAU, 2 FGDs containing 9 participants in each and the other 2 FGDs contains 10 participants in each. The secondary data was collected from, different books; journal articles and different reports and any other necessary literature related to cluster farming both at national and international level.

3.2.4 Method of Data Analysis

3.2.4.1 Qualitative data Analysis

Qualitative data generated through focus group discussions, interviews as well as observation were described and summarized. The qualitative data collected was analyzed under each theme. While conducting thematic analysis, data that was collected from interviews and focus group discussions were transcribed. In order to get familiarized, the data was read, and relevant points were highlighted to be coded. Then, the lists of codes were sorted into themes. The themes were reviewed whether they support the collected data or not. Finally, the themes and sub themes were defined and the data that fit under each theme was written up in direct quote or was be paragraphed.

3.2.4.2 Quantitative Data Analysis

The quantitative data that was collected entered into a computer for analysis using statistical packages for social science (SPSS version 20) soft wares. The study used descriptive statistics for analyzing the quantitative data. The descriptive statistics like frequency, percentage, mean, range, standard deviations and variance were used to describe the characteristics of the respondents. T-test was also used to check the significance of the difference of the two groups on certain measures. For instance to compare the product of male and female cluster farming participant farmers.

3.3 Ethical Considerations.

Before going to the study area for data collection, the researcher ensured a supportive letter, from Addis Ababa university and the woreda office of agriculture. Legal permission was also obtained from the woreda and study participants. Respondents which were selected for providing the data were also briefed about the purpose of the study and its importance. Those selected individuals for the study were also oriented to provide the real information and as their feedbacks will be kept confidential. The researcher also ensured the consent of each participant to participate in the study.

UNIT FOUR: RESULTS AND DISCUSSION.

4.1 Findings of the study

4.1.1 Characteristics of the respondents.

As can be seen in the table below (table 4.1) one can understand that, of the total sampled farmers who were participating in cluster farming 88.5 % were males and 11.5% were females. On the other hand of the total 80 sampled BAU farmers, 76.80% sampled farmers were males and 23.20% of them were females. According to the demographic question that was given for the respondents', to identify their age, of the total 130 respondents, 76.9% farmers who were participating in cluster farming were within the age range of 41-60 ages. On the same manner, 90.48% of farmers who practices farming as BAU were also with in the age range of 41-60 years. Interms of education level 87% of the participants farmers and 65% of BAU, didn't have any formal education as a result they were leveled as uneducated but the majority of them can able to read and write, 3% of the participant sampled farmers drop their school while they reach at high school level. Interms of family Size 32.3% of the respondents respond as they had 4 family size, 36.2% of the respondents respond as they had 5 family size, 22.3% of the respondents respond as they had 6 family size, and 9.2% of the participants farmers were responding as their family size were 7. On the other hand 71.44% of the respondent BAU farmers respond as their family size were 4, 19.05% of the respondent BAU farmers respond as their family size were 5, 9.51%) of the respondent BAU farmers respond as their family size were 7.

So from the above discussion the research conclude as 36.2% of the farmers who participant cluster farming, had a family sizes of 5 and the largest number of BAU farmers 71.44% had a family size of 4. Interms of education level the largest number of both BAU and participant farmers are uneducated. On the other hand the participation of female farmers in cluster farming is less which indicates as there is gender imbalance.

Table 4.1. Characteristics of the respondents'

No	Characteristics of the respondents'		Cluster farming participant farmers		Non participant/BAU/ farmers	
			Number	%	Number	%
1.	Sex	Male	115	88.5	61	76.20
		Female	15	11.5	19	23.80
		Total	**130**	**100**	**80**	**100**
2.	Age	30-40	30	23.1	7	9.52
		41-50	47	36.2	46	57.14
		51-60	53	40.7	27	33.34
		Total	**130**	**100**	**80**	**100**
3.	Marital Status	Married	112	86.1	58	71.44
		Divorced	12	9.2	11	14.28
		widowed	6	4.7	11	14.28
		Total	**130**	**100**	**80**	**100**
4.	Education level	uneducated	113	87	65	80.95
		Primary school	13	10	15	19.05
		Secondary School	4	3	-	-
		Total	**130**	**100**	**80**	**100**
5.	Family Size	4	42	32.3	57	71.44
		5	47	36.2	15	19.05
		6	29	22.3	-	-
		7	12	9.2	8	9.51
		Total	**130**	**100**	**80**	**100**

.

Source: own data.

Besides their bio data's respondents farmers were also asked to mention the amount of land they were using for producing wheat in cluster farming and the result put as follows.

As can be seen from the below table 4.2 almost all the farmers allocated less than a hectare of land for producing wheat by the use of a cluster farming approach. From the total farmers under study 51.53% of the farmers were producing wheat on a total land area of 33.5 hectare, 39.2% of the farmers were also producing wheat on 28.56 hectare of land, 8.46% of the respondent famers were using 6.875 hectare of land for wheat production at cluster level. It was only 0.7% of the farmers who respond as he was producing wheat on his 0.687 hectare of land.

So from this it is possible to conclude as the largest numbers of participant farmers have allocated half a hectare of land for cluster farming which implies as there is land shortage per a house hold level.

Table 4.2. Total land covered by wheat crop by cluster farming

Amount of cultivated land per farmers (hectare)	Frequency (number of farmers)	Total area of land (hectare)	Percentage of land
0.5	67	33.5	48.29
0.56	51	28.56	41.00
0.625	11	6.875	9.73
0.687	1	0.687	0.98
Total	**130**	**69.622**	**100.0**

Source: - Own data

4.2 Data Presentation and Analysis.

In order to understand and get relevant information regarding the contributions of cluster farming to livelihood of farmers, at Siyadebrina wayu woreda, North Shewa, Ethiopia, a five scale likert questionnaire were presented and analyzed. For the purpose of analysis the researcher put his own predetermined mean value on his own study as, strongly disagree (mean 1.00-1.49), disagree (mean1.50-2.49), undecided(mean 2.50-2.99), agree (mean 3.00-3.50) and Strongly agree mean 3.51-5.00).

4.3.1 The change in production per hectare as a result of cluster farming.

I. Productivity

As can be seen from the table below (table 4.3), the highest amount of production per hectare of land practiced in cluster farming system was thirty (30) quintals of wheat and the smallest being

seventeen (17) quintals of wheat per a hectare of land and productivity or production per a hectare of land was 40.42 quintals.

On the other and as it can be seen on the same table, the highest amount of production per hectare of land in the BAU farming system was fourteen (14) quintals of wheat and the smallest being twelve (12) quintals of wheat per a hectare of land and productivity or production per a hectare of land was 27.71 quintals.

So from this one can understand that of the total land used by sample respondent famers for wheat cluster farming which was 69.622 hectare, a total of 2814 quintals of wheat was produced which makes the average wheat production to be 40.42 quintals per hectare of land, and the average production of wheat per individual farmers to be 23.5 quintals.

So from the discussion above it is possible to be make the following conclusions,

- The average production of wheat for the sampled cluster farming participant farmers was 23.5 quintals, whereas as the average amount of wheat for sampled BAU farmers were 13.0 quintal on individual bases.
- The lowest amount of wheat produced by the sampled cluster participants was 17 quintals and the highest was 30 quintals but for the sampled BAU farmers, the lowest amount was 12 quintals and the highest is 14 quintals.
- The productivity or amount of wheat produced by sampled cluster participants per hectare of land was 40.42 but the amount of wheat produced per hectare of land (productivity) by sampled BAU farmers was 27.72 quintal which shows as there was an addition of 12.7 quintal of wheat per hectare of land for cluster farming system.

Table 4.3. Amount of Wheat produced by sample Cluster and non-cluster participant farmers**.**

Amount of wheat produced											
Cluster participant Farmers						**BAU Farmers**					
Number of Farmers	cultivated Land (H.)	Total prod. (Q)	Max. Prod. (Q)	Min. Prod (Q).	Productivity (H/Q)	Number of Farmers	Cultivated Land (H)	Total prod (Q).	Max Prod. (Q)	Min. Prod (Q).	Productivity (H/Q)
130	69.622	2814	30	17	40.42	80	35.25	977	14	12	27.71

On the other hand in order to understand and get relevant information regarding the contributions of cluster farming sample respondent farmers were also requested to fill a five scale likert questionnaire.

According to table 4.4, regarding the increase in the amount of their production due to their involvement in cluster farming, all the respondent farmers 100% strongly agreed with the idea that their involvement in cluster farming increase their production as per a hectare of land with a (Mean=5, St.D=0, DF=129, R=0, V=0). Based on the predetermined mean by the researcher, the mean of the farmers' response which was 5, the researcher concluded as all the respondents farmers strongly agreed as cluster farming increases their production.

To check this increase in production farmers were also asked the same questions in different ways in the FGDs. All the FGDs, participant farmers agreed as there was an increase in the amount of production after they practiced cluster farming. From the information collected during the FGDs it was possible to conclude the idea of the farmers as there were increases in production from 5 quintals to 14 quintals per hectare. In the Interviews that were also conducted with the woreda office of agriculture experts, as well as the developmental agent in the kebele, it was proved as the production in the whole woreda as well as in the kebele under study was increasing from year to year as compared to the BAU ways of farming due to the farmers involvements in cluster farming.

As it was mentioned by sampled farmers, kebele DA and the woreda office of Agricultural experts', the main reasons for the increase in the amount of production of the farmers was related to their proper land preparation, usage of improved seeds and application of fertilizers as well as the positive competition created among the farmers. With regard to fertilizers usage one of the woreda agricultural experts mentioned as there were farmers who use more fertilizers above the recommended amount of fertilizers per hectare of land by the assumption of getting more products. There are different literatures, different empirical researches and studies that support the above ideas of the respondent farmers. Different sources (ATA 2106, Pingu.L (Waldemar Kozolo 2011:15) proved as increasing production was one of the contributions of cluster farming.

On the same manner respondents farmers were also asked to respond whether their involvement in cluster farming increase their bio-mass/bran or not. Of the total respondents 95.4% of respondents respond as they strongly agreed, (0.8%) respondents respond as they were unable to decide or they

respond undecided, and 2.6% respondents respond as they agreed, with a mean of 4.95, Range of 2, variance of 0.067 and St.D of 0.259. Based on the predetermined mean by the researcher, if the Mean which is 4.95 falls at strongly agreed as cluster farming increase the amount of biomass they gained.

So from the above discussion and the field observation by the researcher, this research proved as farmers involved in cluster farming produced more wheat than farmers who practice farming as BAU per hectare of land and also assure as there was an increase in the amount of their biomass.

Table 4.4 Cluster farming participants' farmers' response for the change in the amount of production.

No	Items		Rating								
			SA	A	UD	D	SD	M	St.D	Range	V
1.	My involvement in cluster farming increase my production	No	130	-	-	-	-	5	0.00	0	0
		%	100	-	-	-					
2.	My involvement in cluster farming helps me to increase the amount of biomass I gain from.	No	124	5	1			4.95	0.259	2	0.067
		%	95.4	3.8	0.8						

SA= strongly agree, A= Agree, UD= Undecided, DA= Disagree, SD= strongly disagree, St. D=Standard deviation, DF=129

Source: - Own data.

4.3.2 Cluster farming Communities access to modern inputs.

I. Improved varieties

One of the modern inputs that were distributed to the farmers in the study kebele was improved seeds. Farmers in the kebele can access the modern inputs either in credit or in cash.

As can be seen from table 4.5 of the total 130 sampled cluster participant farmers 74.61% of the farmers were able to access the improved wheat seed from the union on cash and a total 25.39% cluster participant farmers were able to access the wheat on credit bases. On the other hand of the total 80 sampled BAU farmers it was only 13.75% of farmers who were able to access the improved seeds on cash and 7.5% of them access on credit bases from the farmer union.

Table 4.5:- Number of Farmers who can Access Improved varieties of wheat.

Number of Farmers who can Access Improved varieties of wheat.					
Cluster Farmers			BAU farmers		
On cash	On credit	Total	On cash	On credit	Total
97	33	130	11	6	17
74.61%	25.39%	100%	13.75%	7.5%	21.25%

Source: Own data

So from this the researcher discovered that the cluster participants' farmers have better chance in accessing the improved seeds from the union both in cash and in credit as compared to BAU farmers. But since most of the cluster farming participants' farmers have relatively better income they mostly prefer purchasing in cash than accessing in credit.

I. Fertilizers.

As can be seen from the table below (table 4.6) both cluster farmers and BAU farmers were able to access fertilizers from the farmers union. But the difference was that farmers who were involved in cluster farming have an option to access the fertilizers either in cash or credit bases. As a result 13.02% of the clusters farming participant farmers were able to access in cash and 86.98% of the clusters farming participant farmers were able to access in credit. But in the case of the BAU farmers none of the sampled farmers were not able to access on credit bases they can access only in cash.

So the researcher conclude as farmers who were involved in cluster farming system were able to access fertilizers either in cash or credit to the maximum of their needs, but BAU farmers even though they can access the fertilizers they were requested to pay fully in cash during purchasing and in some cases they may not gained what they have requested.

Table 4.6. Number of Farmers who can Access Fertilizers.

Number of Farmers who can Access Fertilizers.					
Cluster Farmers			BAU farmers		
On cash	On credit	Total	On cash	On credit	Total
17	113	130	80	-	80
13.08%	86.92%	100%	100%	-	100%

Source: Own Data.

II. Herbicides and Insecticides.

Like that of modern inputs farmers were have also an access to get herbicides and insecticides from the farmers union and the below table (table 4.7) depict how they were accessing the herbicides and insecticides. As can be seen from on the table, all 130 (100%) of the cluster participant farmers were able to access the herbicides and insecticides in cash than credit. But all of the BAU were not able to access the chemicals and the insecticides from the union either on cash or credit bases; this was due to the large size of the selling containers of the union which limit their purchasing capacity and sometimes what was delivered in the union is totally consumed by the cluster participant farmers. Most of the BAU tries to purchase/get herbicides and insecticides from the cluster participant farmers. In most cases the BAU farmers pay the cost by labor during harvesting, gathering and trashing,

With this the researcher conclude as cluster farming participants farmers gained better benefits than participant farmers in accessing herbicides and insecticides from the farmer union.

Table 4.7. Number of Farmers who can Access Chemicals and Insecticides

Number of Farmers who can Access Chemicals and Insecticides.							
Cluster Farmers				**BAU farmers**			
On cash	On credit	Total	%	On cash	On credit	Total	%
130	-	130	100	-	-	-	

Source: Own Data.

Farmers being accessible to modern inputs have a paramount importance and contributions for the involvement of more number of farmers in the cluster farming system which in turn increase the livelihood of the communities. To know the degree of access of farmers of modern inputs in the kebele understudy respondents' were asked different questions and the result was analyzed as follows.

Based on their access to get improved seeds, fertilizers and others herbicides and insecticides on credit, from the total respondents 80% of the respondents, respond as they strongly agreed, and

20% respondents farmers respond agreed, as their involvement in cluster farming helped them to get the above agricultural inputs on a credit bases, with (Mean = 4.80, St. Deviation = 0.402, Range = 1, and Variance = 0.161. So based on the predetermined mean set by the researcher, since the mean for this specific question, was 4.80 the researcher conclude as the respondent farmers strongly agreed as their involvement in cluster farming helped them to get credit access either in cash or kind.

During the FGD with the farmers and the interview with the woreda experts and with the discussion with the staffs of farmers union at the kebele level, the researcher proved farmers were getting modern agricultural inputs either on credit or cash. By the researcher observation and discussion though these credit facilities were open for all farmers, cluster participant farmers were the one who get priorities than the BAU farmers.

A study in Ethiopia by (Ali and Deininger 2012) which was cited in (Tilahun 2015:5) in support of this idea as the delivery of credit is frequently seen as a key element to increase productivity through more intensive use of fertilizer and seed and to facilitate consumption smoothing.

Sample farmers were also asked whether their involvement in cluster farming help them to access different agricultural tools based on their need. Of the total respondents, 71(54.6%) respondents, respond as they strongly disagreed, 30% disagreed, 13.8% undecided and, 1.5% strongly agreed with the idea, with a mean of 1.64, St.D of 0.835 Range of 4, and Variance of 0.698. Based on the predetermined mean by the researcher, the mean for this question which is 1.64 is disagreed, as a result the researcher concludes as the respondents farmers disagreed with the idea. I.e. their involvement in cluster farming didn't have a significance effect in accessing different modern agricultural tools which increase their effectiveness in their production.

During the focus group discussion most of the farmers were mentioning combiner and thresher as an important tools they were looking for harvesting and threshing their wheat due to the high and ever increasing daily labor cost and untimely rain that affects their products, but either the union or the woreda office of Agriculture were not able to deliver that. In the interview with the woreda office of agriculture, the woreda tried to bring one machine that can assist the farmers in harvesting their crops but due to the nature of the farming system the machine was not compatible to the area. But, though very insignificant as compared to the need and interest of the

farmers the union sometimes supplies different types of modern sickle to the farmers. But farmers were highly interested to use the machine than sickle.

As the study done in 2015 in Ethiopia by feed the future indicates, out of the total sampled 5,969 households engaged in agricultural production, 9 percent of them were using machine power to plough their land, harvest their output, or thresh their crops. 5.5 percent of households reported having used a machine to plough their land either in the 2015 Belg or 2014 Meher season. Mechanized threshing and harvesting was reported by 3 and 2 percent of households respectively. According to the same study in the same year of the total sampled farmers it was 11% in Oromia, 9% Tigray, and 7% Amhara and SNNPR regions farmers to have used machines.[19].(Feed the future 2015). All these shows as the use of machine in the farming system are at its very infant stage.

Table 4.8. Cluster farming participants' farmers' response for their access to get modern inputs.

No	Items	Rating									
			SA	A	UD	D	SD	M	St.D	Range	Variance
1.	My involvement in cluster farming help me to get credit access either in cash or kind	No	104	26	-	-	-	4.80	0.402	1	0.161
		%	80	20	-	-	-				
2.	My involvement in cluster farming helps me to access different agricultural tool based on my needs.	No	2	-	18	39	71	1.64	0.835	4	0.698
		%	1.5	-	13.8	30	54.6				

SA= strongly agree, A= Agree, UD= Undecided, DA= Disagree, SD= strongly disagree, St. D=Standard deviation, DF=129

Source: - Own data.

[19] ESSP (Ethiopia Strategy Support programme), Research Note 48. February 2018

4.3.3 Market linkage Created for cluster farming participants.

During the data collection time and on the discussion that were made with the farmers, woreda office of agriculture and the kebele developmental agent, the researcher able to observe and understand as there was a strong market linkage created between the cluster farming participants farmers and the union. As a result of the linkage created, farmers get the following benefits.

As can be observed in the table 4.9 below all the 130(100%) sampled respondents' cluster farmers were able to gained the different benefit that was created as a result of the market linkage between the farmers and the union as compared to the BAU farmers who didn't have any linkage with the union in selling their products and who didn't gained any benefit from the union.

Table 4.9. Benefit gained by Farmers as a result of Market Linkage.

Benefits gained as a result of Market Linkage created.	Cluster Participant farmers		BAU farmers	
	No	%	No	%
Better price than the nearby market	130	100	-	-
Save time and Energy	130	100	-	-
Protect from unnecessary expenses by traveling to the local market.	130	100	-	-
Sold with a reliable measuring device in the union	130	100	-	-

.

Source: - Own Data.

Without creating a market linkage among the producers and the end consumers, there will be more surplus production in one area while there is also be an area with shortage of production. So to make a fair distribution of resources among citizens of a country and to create mutual benefits for both the producers and the end users there should be a market linkage. In area where there is cluster farming there is supposed to be more products as compared to other areas, as a

result there should be a market linkage created among surplus producers and consumers. So respondent farmers in the study kebele were asked about the market linkages that were established to sell their products in the farmers union that was established for solving these marketing problems and the result was analyzed as follows.

As can be seen from the table below (table 4.10), of the total respondent farmers for the question, farmers union established for purchasing my product is strong, 433.1% of the respondents reported as they strongly disagreed, 54(41.5%) disagreed, 21(16.2%) undecided, 7(5.4%) agreed and 5 (3.8%) strongly agreed with the idea, with a mean of 2.05, St.D of 1.029, Range of 4, and variance of 1.059. So based on the predetermined mean, the Mean of the response (2.05) is disagreed, as a result the researcher conclude as the respondents farmers disagreed with the idea of, farmer union established for purchasing their product is strong.

Besides the above responses, in the FGDs conducted with the farmers, almost all the farmers reported as the management body of the farmer union didn't have frequent discussion to solve the problem of the farmers and even they didn't have agreement among themselves. As a result of these there was a frequent turnover of the chairman of the union and even during the researcher visit, it was a newly assigned chairman whom the researcher met at his home and learned that as he didn't have relevant information about the union better than the farmers. This idea is also supported by the below study which was done in 2016.

According the study that was done in Ethiopia (Dejene and Matthews 2016:60), though the origin of farmers union or cooperative trace back to 1960s' most of the union established were not so strong due to internal and external factors. The internal factors include, low awareness background of members, limited capacity of management committee, inadequate internal capacity, low participation of members in business etc. and the external factors include unhealthy competition from private traders and negative attitude of non-members.

Sample respondent farmers were also asked about the price of the union while selling their products, of the total respondents 42.3% replied as they were strongly agreed, 42(32.3%) reported as they agreed and it was only 15(11.5%) of the respondents who strongly disagreed with the idea with a mean of 3.82, St.D 1.389, Range 4, and Variance of 1.930. Based on the

predetermined mean, the mean 3.82 for this question falls within as strongly disagreed, the researcher concludes as the respondents farmers strongly agreed as the cost of their union is fair.

To check the fairness of the cost of the union, farmers were asked in the FGD to further explain their ideas. As to the farmers response to this question, as compared to the cost of the nearby market which was far from 15-20 Km from the kebele the cost of the union has a difference of at least 20 birr per quintal. Besides the cost, the measurement device the union used was a much trusted one than individual merchants measuring device. Besides the fair price of the union, farmers explain by selling their products in the union they save their time, energy and money.

The idea of the farmers who were part of the different FGD regarding to the price of the union is summarized as follows,

> *"…… if we travel to sell our products to the nearby market, we always used our donkeys or the donkeys of our close friends and relatives to pack the product. Then we are Supposed to travel at least 1:30-2:00 hrs to reach the nearby market at one trip and it became double when we came back home again. After selling our products since we get tired and hungry we may join to the local drinking houses and spent some of our money for lunch and drink. Even after selling our products since we have the donkeys with us, we return back home on foot and sometimes we may get sick and may not able to did other activities for a half or a full day. Sometimes even after with all these hardships to travel to the market, the market price may falls below the price of the union and the measurement used by the merchants may not be reliable. In some rear cases, robberies may took our money and we may lost it due to the lack of care and we may also cheated by the individual purchaser. ……"*

In the interviews that were also conducted with the woreda office of agriculture experts, they also confirmed as the buying price of the union was better than the market price. The price to buy the products of the farmers by the union was always decided after checking the cost of each nearby market once in a week.

As the study done by (Bernard, Tafesse, and Gabre-Madhin 2008) on analysing the impact of co-operative membership on access to output markets which is cited in (Delelegn 2016:3) supported the idea as the price of the farmers union is fair and better than others. According to the source, co-operative members in Ethiopia on average received 7.2–8.9 % higher prices for their agricultural products than non-members.

Respondents' farmers were also asked to explain their feeling about the purchasing manner of the farmers union in timely manner and the result is explained as follows. Of the total respondent farmers 63.1% of farmers respond as they strongly disagreed, 19.2% disagreed, 17(13.1%) undecided on the idea of the timely purchasing manner of the union with (M=1.62, St.D=0.983, R=4, V=0.965). Based on the predetermined mean (1.62) for this question falls within disagreed, the researcher concludes as the respondents farmers disagreed with the idea of farmers union purchasing their products in timely manner.

In the FGDs that were conducted with the farmers, with regard to the farmers' union timely purchasing norms, farmers express their dissatisfactions. They explained as the union did not open or didn't purchase their products always. Mostly the union was ready to buy the farmers product when they were requested to pay for the fertilizers. Sometimes the union took their products with credit and was not punctual to pay as promised. This idea was also supported by two of the employees of the union. According to the workers of the union, sometimes they were advised by their top line managers to buy the farmers' products by credit as the credit will be paid with two to three days, but in most of the occasions there were delay and this created high dissatisfaction on the farmers.

Respondent farmers were also asked to express their feeling and attitude about the capacity of the union especially on the storage of the union. Their response for the question, "The farmers union has enough storage to buy my products." of the total respondents 71.5% of the farmers strongly disagreed and 25.4% of the respondents disagreed with the idea with a mean of 1.32, St.D of 0.529 and range of 2, and variance of 0.280.

Based on the predetermined mean by the researcher, the mean (1.32) falls as strongly disagreed. So the researcher concludes as the respondents farmers strongly disagreed as the farmers union had enough storage to buy their products.

As can also be observed by the researcher during the field visit the union has a very small size storage house that can't be able to store if the union bought the product of the farmers aggressively. Besides the size it was a store made of wood and mud which can be a comfort zone for insects that can harm the wheat in the store.

In the FGD farmers express as the store was a very ordinary house which can mix the different variety of wheat together and which also mixes the wheat with soil and dust particles. The union also accept as their storage was not to the standard.

Farmers under the study were also asked to evaluate the administrative body of the union. As a result, of the total 130 respondents farmers 66.9% of the farmers strongly disagreed and 31.5% of the farmers disagreed with the idea which says, the farmers union has strong administrative body with a mean of 1.36, St.D of 0.571 and range of 3, and a variance of 0.326. Based on the predetermined mean, the mean (1.36) for this question falls within the range of strongly disagreed. So the researcher concludes as the respondents' farmers strongly disagreed with the idea. As can also be proved in the FGD discussion and with the interview with the kebele level Das and the woreda office of agriculture experts the administrative body of the farmer union was weak and follow a very traditional way of administration. Even there was disagreement among the members who were elected from the farmers and the employees of the union.

The strength or weakness of an organization can be determined by its administrative body. If the administrative bodies are educated and follow modern forms of management rules and procedures the fate of the organization to be strong is high and if not the reverse will happen. In support of this idea the study done by Professor Georg, explained the following. "A very dramatic improvement in the standard of living in the rural communities will happen if there is efficient administrative and management of institutions perhaps the redesigning of those institutions responsible for development" (Georgeo Tasie 2012:40).

In the same manner farmers were also asked about the commitment of the union staffs as a result 73.8% farmers strongly disagreed and 18.5% of the respondents farmers disagreed with the idea of the Farmer union has committed staffs with a mean of 1.35, St.D of 0.617 and range of 2, and a variance of 0.381. Based on the predetermined mean, the mean (1.35) for this question falls

within the range strongly disagreed, the researcher concludes as the respondents farmers strongly disagreed with the idea of the union staffs has commitment for their work.

Like the other ideas, the lacks of commitment among the staffs of the union were also supported by the FGD conducted with the farmers. If the staffs of a certain organization lack commitment for their organization and work, the organization will not be successful and may fell to achieve its goal. According to (Chen, etal 2006) who studied the relationship between organizational commitment, and job performance explained that there was a positive relationship between organizational commitment and job performance. Their study further suggested that companies needed to strengthen their employees' commitment towards organization in order to enhance organizational performance.

Table 4.10. Market Linkage created.

No	Items	Rating									
			SA	A	UD	D	SD	M	Range	St.D	Variance
1	The farmers union established for Purchasing my product is strong	No	5	7	21	54	43	2.05	4	1.029	1.059
		%	3.8	5.4	16.2	41.5	33.1				
2	The cost of farmers union established for purchasing my products is fair	No	55	42	3	15	15	3.82	4	1.389	1.930
		%	42.3	32.3	2.3	11.5	11.5				
3	The farmers union purchase my products in timely manner	No	4	2	17	25	82	1.62	4	0.983	0.965
		%	3.0	1.5	13.1	19.2	63.1				
4	The farmers union has enough storage to buy my products	No	-	-	4	33	93	1.32	2	0.529	0.280
		%	-	-	3.0	25.4	71.5				
5	The farmers union has strong administrative body	No	-	-	2	41	87	1.36	3	0.571	0.326
		%	-	-	1.5	31.5	66.9				
6	The farmers union has committed staffs.	No	-	-	10	24	96	1.35	2	0.617	0.381
		%	-	-	7.7	18.5	73.8				

SA= strongly agree, A= Agree, UD= Undecided, DA= Disagree, SD= strongly disagree,
St. D=Standard deviation, DF=129

Source: - Own data.

4.3.4 Contributions of cluster farming to the livelihood of the farmers.

4.3.4.1 Cluster farming participant Farmers response

According to the source from ATA Agricultural clusters were introduced and established in Ethiopia to serve as models for learning as Ethiopia intensifies the cluster approach and scales up best practice across the country.[20] Cluster farming specially wheat cluster farming was conducted in the woreda under study for the last three years with the gradual and yearly increases in the number of farmers participated and in the amount of Agricultural land allocated for cluster farming.

That being said respondent farmers were asked to rate their feeling on the different contributions of cluster farming. As it is depicted in the table below (4.11) the response of the farmers for the idea, as their involvement in cluster farming helps themes to build a separate house for their cattle, of the total respondents 95.4% and 4.6% of the respondent strongly agreed and agreed with idea respectively with a mean of 4.95, St.D 0.211, R 1, and V, 0.44. Based on the predetermined mean, the mean (4.95) for this question falls as strongly agreed, and the researcher concludes as the respondents farmers strongly agreed with the idea of their involvement in cluster farming helped them to build a separate house for their cattle.

As it was mentioned in the FGD some famers respond as they left their old house for their cattle and some other also build a new house with corrugated sheet of Iron for their cattle because of the increase in their production that happens as a result of cluster farming. During the field visit the researcher also saw some houses made for their cattle. Constructing a separate house for cattle, besides being a contribution of cluster farming, it also has its own positive impact on the health of the farmers and their families as being in a distance from the bad smell of the cattle waste products. So it is also possible to conclude cluster farming has an indirect contribution for the improvement of the health of the farmers and the families.

[20] http://www.ata.gov.et/our-approach/agricultural-commercialization-clusters-2/

Farmers were also asked whether their participation in cluster farming helps them to earn more products which in turn help them to deposit money at commercial banks. Therefore 77.7% strongly agreed and 20.8% agreed with the idea with a mean of 4.76 St.D 0.463, R 2, and V, 0.214. So based on the predetermined mean by the researcher, since the mean 4.76 is within the range of 3.51-5.00 which is strongly agreed, the researcher concludes as the respondents farmers strongly agreed with the idea as their involvement in cluster farming helped them to deposit some money in the bank.

To cross check this idea, the researcher tried to communicate the chairman of the kebele whether there were farmers who open bank book or not, the chairman of the kebele show the researcher the list of the farmers who was requesting personal ID card for opening a bank book. In the informal discussion with some of the participant farmers even though some of them didn't open bank book, they deposit their money in the form of kind. E.g. they rent land, bought cattle and sheep for fattening etc. In the interview held with the kebele developmental agent he explained as there were some farmers who opened bank book but the purpose may not only for depositing but also to receive money from their children who are working in Addis and Abroad. Though the idea of creating awareness on saving and making some of the farmers to save was a result of so many different parties, the contribution of cluster farming by increasing the production of the farmers was so immense. So this research can conclude as the cluster farming had contributed for the saving.

Respondent farmers were also asked whether their participation in cluster farming contributed to send their children to school or not and almost all 99.2% of them strongly agreed with the idea with a mean of 4.99, St.D, 0.088, R, 1, V, and 0.008. Based on the predetermined mean by the researcher, the mean (4.99) for this question fall as strongly agreed. So the researcher concludes as the respondents farmers strongly agreed with the idea of farmers involvement in cluster farming contributed for the farmers to send their children to School. During the FGD with the farmers besides sending their children to schools, respondent farmers expressed as most of them were able to rent a house for their high school children instead of forcing them to travel 1:30-2:00 hrs. on daily basis. Farmers were also asked other change that happen in their life after they were being participated in cluster farming, and of the total 130 respondent farmers, 96.9% of the respondents farmers respond as they strongly agreed with a Mean of 4.97, Range of 1 standard

deviation of 0.173, and variance of 0.0301 as their feeding habit is changed and on the same manner for the question that refers to farmers involvement in cluster farming changed the life styles of the farmers all 100% of the respondents strongly agreed as their dressing habits improved after they were being involved in cluster farming with a mean of 5, Standard deviation of 0.000, range 1 and variance of 0.000. Based on the predetermined mean by the researcher, since the mean for the above two questions were (4.97 and 5.00) it falls within the range of 3.51-5.00 which is strongly agreed. So the researcher concludes as the respondents farmers strongly agreed with the idea of their involvement in cluster farming had contributed a lot for the change in their feeding habits and dressing habits.

In the FGD discussion with the farmers, most of the farmers express as there is a change in the feeding habits and dressing style. In terms of their feeding, before they started to involve in cluster farming, most farmers were mostly sold the butter they gained from their cows and bought oil with a lesser price and they reported as they were using butter during big holidays only but by now most farmers consume the milk and milk products for themselves and their families. Farmers of the FGD participants also mentioned as their dressing habit changed a lot. The researcher also observed as there were a change in the dressing style of the farmers. Almost all the FGD participants' farmers wear shoes and better quality clothes than before.

Table 4.11. Contributions of Cluster Farming**.**

No	Items	Rating									
			SA	A	UD	D	SD	M	St.D	Range	Variance
1.	My involvement in cluster farming helps me to build a separate house for my cattle.	No	124	6	-	-	-	4.95	0.211	1	0.44
		%	95.4	4.6	-	-	-				
2.	My involvement in cluster farming helps me to deposit money	No	101	27	2	-	-	4.76	0.463	2	0.214
		%	77.7	20.8	1.5	-	-				
3.	My involvement in cluster farming helps me to send my children to school	No	129	1	-	-	-	4.99	0.088	1	0.008
		%	99.2	0.8	-	-	-				
4.	My involvement in cluster farming helps to improve mine and my families feeding habits.	No	126	4	-	-	-	4.97	0.173	1	0.030
		%	96.9	3.1	-	-	-				
5.	My involvement in cluster farming helps to improve my dressing habits	No	130	-	-	-	-	5	0.000	0	0.000
		%	100	-	-	-	-				

SA= strongly agree, A= Agree, UD= Undecided, DA= Disagree, SD= strongly disagree, St. D=Standard deviation.

4.3.4.2 Non-cluster participant /BAU/farmers' response.

For having a better understanding about the contribution of cluster farming, farmers who practice farming as BAU were asked different questions. The questions that were responded by the BAU farmers gave a very brief picture how cluster farming contributed for the improvement of the life of the communities.

As can be seen from the below table from the total BAU respondents, largest number of respondent (76.25%) of farmers allocates their 30.5 hectare of land for producing wheat which makes the total share of land to be 0.5 hectare per individual farmer and the remaining 23.75%

farmers allocate their 4.75 hectares of land for producing wheat which again makes the individual farmers share to be 0.25 hectare of land.

Therefore from the information mentioned above the researcher conclude as the majority of the non-cluster participants farmers land holding was small in size which makes them to allocate a very small size of their land for producing different varieties of crops including wheat.

Table 4.12:-Total land covered by wheat crop by non-cluster farming.

No	Amount of cultivated land (hectare)	Number of farmers /Frequency	Total area of land (hectare)	% of farmers
	0.25	19	4.75	23.75
	0.5	61	30.5	76.25
	Total	**80**	**35.25**	**100.0**

Source: - Own data

To saw the contribution of cluster farming in different social classification criteria sampled BAU farmers were requested to express their response on different questions. These questions better clarify whether cluster farming had better contribution for the farmers or not. The response of the BAU farmers basing the below table was analysed as follows.

As a result of the total 80 respondents 76.2% and 19% of the non-cluster farming participant farmers responds as they strongly disagreed and disagreed respectively for the question, "My involvement in cluster farming helps to increase my production" with a Mean of 1.27, St.D of 0.566, Range, 2, and a variance 0.314. Based on the predetermined mean by the researcher, since the mean for the above question was (1.27) it was strongly disagreed. So the researcher concludes as the respondents BAU farmers strongly disagreed with the idea as their being un-involvement in cluster farming had effect in their production.

With regard to the amount of bio mass they gain 90% of the respondent farmers express as they strongly disagreed, and 10% of them express as they disagreed on the idea with (M=1.10, St.D=0.302, R=1, V= 0.091). Based on the predetermined mean, the mean for the above question was (1.10) it falls within strongly disagreed category. So the researcher concludes as the

respondents BAU farmers strongly disagreed with the idea as their being un-involvement in cluster farming had effect in amount of bio mass they gained.

Besides the responses of the farmers during the field visit and the FGDs researcher had with the BAU farmers, they expressed as their being not involved in the cluster farming had a significant negative effect on their production level. Since the participant farmers follow the direction and management practice given by the DA, the improved seed they used, and the fertilizers they were applying had their own contributions for the wheat to be tall in length which in turn resulted in high amount of production and biomass. So from the above discussion which bases the responses of the respondents, the researcher conclude as the non-participant farmers were not able to gained wheat production and bio mass like that of the cluster farming participant farmers.

Farmers which were not involved in cluster farming/BAU/ farmers, were also asked whether "My involvement in cluster farming helps me to build a separate house for my cattle.", a result 57.7% Strongly disagreed, 23.8% disagreed and 13.8% undecided, (M=1, 56, St.D=0.726, R=2, V= 0.528 with the above idea with the mean for the question was 1.56 the researcher concludes as the respondents BAU farmers strongly disagreed with the idea.

During the FGD, the BAU farmers express their idea as the majority of them were not able to construct a separate house for their cattle due to the high cost of the construction materials. There were some farmers who construct a separate house for their cattle but In terms of quality and size it was not comparable with the farmers who were involved in cluster farming. The separate house constructed by those BAU farmers for their cattle were made of grass and small in size, which can only be used during the winter season when there is no rain.

Farmers which were practicing farming as BAU practices were also asked whether their BAU practice had negative effect on the their capacity of depositing money or not. As a result 62.5% strongly disagreed, 23.8% disagreed and 13.8% undecided, on the idea with (M=1.51, St.D=0.729, R=2, V= 0.531.) Based on the predetermined mean by the researcher, since the mean for the question was (1,51) it fall within strongly disagreed category Therefore the researcher concludes as the respondent BAU farmers strongly disagreed with the idea as their being BAU farmers didn't allow them to gain more income which in turn affect their status to deposit money in banks.

With related to depositing money in the bank, BAU Farmers which were attending the FGD express as they were not able to open back book as compared to their relatives and neighbours who open and deposit money. Though, the less amount of production deprived these farmers not to deposit money in the bank, the system has also its own impact. Some of the BAU farmers express their feeling in relation to this,

> *Farmers which were engaged in cluster farming were encouraged by the woreda office of Agriculture as well as the developmental agent to open bank book that will help them to save money and to get bank interest. But this awareness creation was not given to us since we didn't have strong linkage and communication with these experts. If we were communicated we can save money even though it will not be as equal as the cluster participant framers.*

With these, the research conclude that the less amount of production of BAU farmers and the less awareness the BAU farmers had, contributed the BAU farmers not to deposit money,

Farmers which were not participated in cluster farming were also asked the effect of their un-involvement to send their children to school; the sampled respondent farmers' response was as follows, 15% Strongly disagreed, 53.8%, disagreed and 31.3% undecided with a mean of 2.16, St.D=0.665, R=2, V= 0.442. Based on the predetermined mean by the researcher, since the mean for the question discussed above was (2.16) it falls within disagreed category. As a result the researcher conclude as the respondents BAU farmers agreed with the idea as their being BAU farmers didn't allow them to send their children to school as compared to cluster farming participant farmers.

In the FGD with the farmers the participants farmers express as they all send their children to school, but the difference was that participants' farmers were able to send their children to school during all school days but the BAU farmers sometimes needs the labor of their children since they were not able to pay for the daily workers. In addition farmers which were not involved in cluster farming were not able to rent house for their high school children who were attending their education in the town as a result, their children were traveling 1-2 hrs walking distance from their home to their school on every school days. But participant farmers were able to rent

house for their high school children, and they didn't let their children to be absent from class during schools days.

With this finding the research conclude that Farmers which were not involved cluster farming though they were sending their children to school they were not able to fulfill what is required by the students and in some school days, they were also using the labor of their children as the expense of their education. Besides this their children were traveling 1-2 hrs walking distance to attend their high school which had a very high negative impact to their success in their school.

Table 4.13. Contributions of Cluster Farming Non-participant famers' response**.**

No	Items	Rating									
			SA	A	UD	D	SD	M	St.D	Range	Variance
1.	My involvement in cluster farming helps to increase my production	N			3	16	61	1.27	0.560	3	0.314
		%			3.8	20	76.2				
2.	My involvement in cluster farming helps me to increase the amount of biomass I gain from.	N				8	72	1.10	0.302	1	0.091
		%			-	10	90				
3.	My involvement in cluster farming helps me to build a separate house for my cattle.	N			11	23	46	1.56	0.726	2	0.528
		%			13.8	28.8	57.5				
4.	My involvement in cluster farming helps me deposit money	N			11	19	50	1.51	0.729	2	0.531
		%			13.8	23.8	62.5				
5.	My involvement in cluster farming helps me to send my children to school	N			25	43	12	2.16	0.665	2	0.442
		%			31.3	53.8	15				
6.	My involvement in cluster farming helps to improve mine and my families feeding habits.	N			4	25	51	1.41	0.589	2	0.347
		%			5	31.3	63.8				
7.	My involvement in cluster farming helps to improve my dressing habits	N			5	21	54	1.39	0.606	2	0.367
		%			6.3	26.3	67.5				

SA= strongly agree, A= Agree, UD= Undecided, DA= Disagree, SD= strongly disagree, St. D=Standard deviation, DF=79

Source: Own Data.

Independent sample t-Test was also carried out to verify whether or not gender and Level of education has impact on amount of wheat production and results are given in the following Tables. Table 4.14 A indicates that 115 males have a mean value of 21.69 and SD as 1.744 and 15 females have mean value of 21.33 and SD as1.759 in their wheat production performance.

Table 4.14B shows Levene's test for equality of variances, and indicates that variances for respondents does not differ significantly (p-value, 0.814 >0.05) from each other. Then 'Equal Variance Assumed' assumption was taken and t-test for equality of means was carried out to compare average values between respondents. As the p-value from the t-test for equality of means (p=0.814), is greater than the significance level 0.05, it was concluded that there is sufficient evidence to say, at the 5% level of significance, that "there are no significant differences in the amount of wheat production between male and female farmers involved in cluster farming at Siyadebrina wayu woreda.

Table 4.14 A. Independent t-test for Cluster farming respondents (Sex and Production)

Variables	Sex of respondents	N	Mean	St. Deviation	Std.Error mean
Amount of Wheat produced	Male	115	21.69	1.744	0.163
	Female	15	21.33	1.759	0.454

Table 4.14 B. Independent t-test for Cluster farming respondents (Sex and Production)

Amount of Wheat produced		Levene's Test for Equality of variances		t-test for Equality of Means						
	Equal variances assumed	F	Sig	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95%Confidence Interval of the Difference	
									Lower	Upper
	Equal variances not assumed	0.056	0.814	0.738	128	0.462	0.354	0.479	-0.595	1.302

Table 4.15A indicates that 113 educated farmers have a mean value of 21.64 and SD as 1.808 and 13 uneducated have mean value of 21.77 and SD as 1.301 in their wheat production performance.

Table 4.15B shows Levene's test for equality of variances, and indicates that variances for respondents does not differ significantly (p-value, 0.445 >0.05) from each other. Then 'Equal Variance Assumed' assumption was taken and t-test for equality of means was carried out to compare average values between respondents. As the p-value from the t-test for equality of means (p=0.445), is greater than the significance level 0.05, it was concluded that there is sufficient evidence to say, at the 5% level of significance, that "there is no significant differences in the amount of wheat production between male educated and uneducated farmers involved in cluster farming at Siyadebrina wayu woreda.

Table 4.15 A Independent t-test for Cluster farming respondents (level of education and Production)

Variables	Level of education	N	Mean	St. Deviation	Std.Error mean
Amount of Wheat produced	Educated	113	21.64	1.808	0.179
	Uneducated	13	21.77	1.301	0.361

Table 4.15 B Independent t-test for Cluster farming respondents (level of education and Production)

Amount of Wheat produced		Levene's Test for Equality of variances		t-test for Equality of Means						
	Equal variances assumed	F	Sig	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95%Confidence Interval of the Difference	
									Lower	Upper
	Equal variances not assumed	0.586	0.445	-0.255 -0.331	124 17.832	0.799 0.744	-0.132 -0.132	0.517 0.399	-1.155 -0.971	0.891 0.707

CHAPTER FIVE: CONCLUSION AND RECOMMNADATIONS.

5.1 Conclusion.

This study is mainly focused on studying the contributions of cluster farming to the livelihood of farmers, at Siyadebrina wayu woreda, North Shewa, Ethiopia. In the process of the research both cluster farming participants' as well as farmers who are not involved in the cluster farming which are referred as BAU were involved. The overall objective of this research was to investigate the contributions of cluster farming to the livelihood of the farmers at Siyadebrina wayu woreda of North Shewa zone, with a four specific objectives.

To make the study fruit full a total of 130 cluster farming participants farmers and 80 BAU farmers, were requested to respond both open and close ended questions and FGD was also held. Two woreda level crop experts and one Kebele level DA were also interviewed to reflect their filling a bout the contributions of cluster farming in the livelihood of the farmers. All relevant information related to cluster farming was also reviewed from different empirical studies, books, journals and reports. So from the result of the study the following conclusion was made

In terms of productivity, the result of the study revealed as production and productivity of farmers who were involved in cluster farming, was by far increased as compared to BAU farmers. Farmers who were involved in cluster farming produced 40.42 quintals of wheat per a hectare of land, and the average production of wheat per individual farmers was 21.65 quintals. On the other hand the average wheat production of farmer who practices BAU was 27.72 quintals per hectare of land, and the average production of wheat per sampled individual farmers was 12.21 quintals.

In relation to credit access, the farmer union which was established in the Kebele is tasked to sell different modern inputs to the farmers and to purchase agricultural products from the farmers, the result of the study revealed as farmers who were involved in cluster farming had better access to get fertilizers, improved seeds and different chemicals on either credit or cash bases. As a result of this access, a significant number of cluster participant farmers where accessing modern inputs on credit bases as compared to BAU farmers.

When production increased because of the application of modern inputs, there is high interest and request from the farmers for different agricultural tools like combiner, harvester, thresher which can reduce high production loss during harvesting because of untimely rain and bad harvesting habit. But the result of this study proved as this request of the farmers is still not full filled either by the farmer union or the woreda bureau of agriculture or any private machine owner on rental bases.

With a high increase in production, there is a better surplus product in that specific area and the market cost will falls which in turn affect the life of the farmers. This problem can be solved by creating market linkage with producers and industries as well as by establishing union which can buy the farmers product with a fair price. As the study revealed in relation to the market linkage created for the cluster farming participant farmers, a farmer union was established to buy to the products of the farmers. As a result of the market Linkage that was created between the farmers and the union the study revealed as the cost of farmers union for purchasing the products of the farmers was fair and better than the costs of the same amount of commodities in the nearby markets. Besides the fair cost the study also proved as the farmer union that was established in the kebele had saved time, energy and money of the farmers which they spent while selling their products by traveling from 20-40 Km distance from their home. But even though the market linkage has so many advantageous there is still a lot of problems that need to be solved on the side of the farmer union which includes problems related to the administration capacity and staffs commitment of the union, the timely purchasing power and storage facility of the union.

The study further revealed as there were different contribution of cluster farming to the farmers who were involved in cluster farming in comparison with the BAU farmers. To mention some among the different contributions it helps the farmers to build a separate house to their cattle by corrugated sheet of Iron, helped them to send their children to school by full filling all the necessary stationary materials and by renting houses in the woreda capital, helped them to deposit money in commercial bank in cash or they were able to increase their assets in kind.

5.2 Recommendations.

As had been discussed in chapter four the research proved as cluster farming had brought a lot of contribution for the improvement of the livelihood of the community. But different actors who have involvement in cluster farming need to work hard to strength these contributions. As a result the researcher mentions the following as recommendations for the betterment of the local community through cluster farming.

- The role of the woreda office of agriculture in the agricultural sector of Ethiopia for introducing and expanding cluster farming in the woreda in general and in each Kebele in particular is so immense and irreplaceable. Therefore the research recommends the woreda office of agriculture to strengthen these activities to the extent of involving all farmers of the woreda in to the cluster farming system and to strength the already participants farmers in the system for ever.
- Cluster farming in the woreda as well as in the kebele was practiced only in wheat, but the kebele under study is also suitable for beans, chickpeas, and teff production. So the woreda should also work to motivate the farmers to start cluster farming in other crops like that of wheat and need to deliver improved seeds of the others crops too.
- One of the reasons for the increase in production for cluster farming participant farmers was the application and use of modern inputs like fertilizers and insecticides. But majority of the respondents express their dissatisfaction to the delivery of fertilizers on timely bases in their request amount. So the woreda office of agriculture should collect the needs of the farmers and work in close contact with the fertilizers and improved seed suppliers companies to delivery on time.
- The farmers union which was established with the aim of providing support for the farmers in marketing and other service delivery was by far lower than the needs of the farmers. Therefore the woreda office of Agriculture should work in close contact with the Union higher officials to improve the service delivery.
- There was a rumour as some farmers were using more fertilizers above the recommendation level of the soil and the size of their agricultural land which in the future has environmental impact for that particular farm land and the surrounding areas,

therefore the woreda office of agriculture through its DAS should strongly advise and follow the farmers in their utilization and application of fertilizers.

- With improper usage of fertilizers and pesticides and the containers, though there is less problem reported, if these will not be properly managed the problem created by this may affect the environment and the community. Therefor the woreda office of agriculture should create awareness to the farmers about the proper handling of the chemicals and their containers.
- The purchasing time of the union is not consistent and sometimes farmers were not able to get the service when they are in need. So the purchasing time should be consistent and should also be communicated for the farmers. Farmers appreciate the fairness of the cost as compared to the local market price and the research recommends the union to continue this as it was.
- Sometimes the union bought wheat from the farmers by credit, but farmers were highly dissatisfied as the union was not loyal to its promise in making the credit payment on timely bases. So the research recommends for the union to make the credit payment on the agreed time line. The majority of the customers are farmers who keep trust on the union, but if the union lost this trust due to lack of proper handling of its customers, it may be hard to get the buy in of the farmers. The capacity of the union in terms of human resource and material resource like office and store house was not fair enough. So the research strongly recommends the union to improve the human resources and material resources of the union. Especially the staffs of the union should get training on customer handling service.
- It has been observed and there were also some gossip as some farmers were using more amounts of fertilizers with the aim of getting more amounts of products, but this was not ethical to the discipline. So farmers should apply the proper amount of fertilizers and pesticides in the proper amount and ways as advised by the developmental agents. Though Fertilizers and pesticides have benefits in increasing production, if they will not be properly administrated they have a negative impact in production as well as affecting the life of farmers and their families as well as their live animals. So once the chemicals are used the containers should be properly cleaned and exposed to free air before using them to store any other materials which can be used as a food for human being and the

animals and the waste products from the container should also be properly disposed far away from water bodies and plant otherwise it may affect the whole ecosystem.

- The farmer union which was established in the kebele was to provide benefit for the farmers and the farmers should develop trust in it. Sometimes the union may not have enough cash in the buyers hand on the spot. So the farmers should accept as selling by credit is a normal business style in the modern world and should develop trust on the union. But as a witness they should get a written document from the union as they sell their product without get their payment. The witness document should have the amount of the product with its cost.

Further Research

This study recommends to intellectuals, practitioners, and government bodies to undertake further research on the following issues that the study never touches thereby adding knowledge to this study finding

1. Effect of applying Fertilizers above the recommended ratio.
2. Effect of solid waste disposal especially the disposal related to pesticides and herbicides containers.

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APPENDIX I

Addis Ababa University

College of Development Studies

Centre of Environment and Sustainable Development

A Questionnaire for Sample farmers participated in Cluster farming.

Dear respondent, I am studying my MA in Environment and Sustainable Development in Addis Ababa University. Now I am working my thesis and the purpose of the research is to investigate the contribution of cluster farming to the livelihood of the farmers at SIYADEBRINA Wayu woreda, North Shewa, Ethiopia. As a researcher I am kindly requesting you to give your genuine answers without any hesitation for the below questions. Your genuine responses are preconditions for this research to attain its goal. It is only based up on your own consent to respond the questions. Therefore, please feel free to respond to the questions to the best of your knowledge.

Thank you in advance for your collaboration!

Date of interview _____.

I. **Personal details of Respondent**

1. Code _____2. Age _____ 3. Sex _____ 4 Kebele._____

5.Gote/ Village/_____6. Marital status: _____7. Level of education: _____

8. Total number of the family in your household _____

9. Amount of cultivated (hectare) land for all crops_____

10. Amount of cultivated land (hectare) for wheat_____

II. Main questions. (Participants farmers)

1. Who Create an awareness for you to start cluster farming

   A. Kebele level DA/woreda office of Agriculture B. A friend/ a neighbor who participate before me C. by my own D. an influence from a friend/neighbor and kebele level DA.

2. How do you evaluate the change in the amount of production per hectare before and after your involvement in cluster farming?

   A. Increase B. no change at all C. Decrease D. there is a very high increase in the amount of production.

3. Amount of wheat produced per hectare of land in Quintals_____.
4. Amount of biomass/Hey/ you get from the wheat farm_____.
5. Is there an increase in the amount of Hey /biomass/ before and after your participation in cluster farming_____.
6. If there is an increase in the amount of production what do you think the reason would be? _____
7. Can you access fertilizers, improved seeds, herbicides and insecticides from the union in a credit form?
8. What is the amount of fertilizers you used for your wheat production for the cluster farm

   A. Urea_____ quintals B. Dap_____ quintals C. Others_____.

9. What is the amount of improved seed you used for the cluster farm in Quintal _____?
10. What is the Amount of pesticides (liters) used for your wheat production for the cluster farm?
11. How many liters of Herbicides do you use your wheat production for the cluster farm
12. Have you ever used machine to plough your land, harvest or trash your products?
13. If ” yes” from where do you get the machine
14. What kind of advantage did you get from the union as being involved in cluster farming than BAU farmers?

No	Issues	Likert scale				
		Strongly disagree (1)	Disagree (2)	Undecided (3)	Agree (4)	Strongly Agree (5)
	Objective 1. Productivity					
1.	My involvement in cluster farming increase my production					
2.	My involvement in cluster farming helps me to increase the amount of biomass I gain from.					
	Objective 2. Credit access					
3.	My involvement in cluster farming help me to get credit access for either in cash or kind					
4.	My involvement in cluster farming helps me to access different agricultural tools based on my needs.					
	Objective 3. Market Linkage					
5.	My involvement in cluster farming helps me to sell my products at the farmer union.					
6.	The farmers union established for purchasing my product is strong.					
7.	The cost of farmers union established for purchasing my products is fair.					
8.	The farmers union buy my products in timely manner					
9.	The farmers union has enough storage to buy my products.					
10.	The farmers union has strong administrative body.					
11.	The farmer union has committed staffs.					
	Objective 3. Contributions					
12.	My involvement in cluster farming helps me to build a separate house for my cattle.					
13.	My involvement in cluster farming helps me to deposit money					
14.	My involvement in cluster farming helps me to send my children to school					
15.	My involvement in cluster farming helps to improve mine and my families feeding habits.					
16.	My involvement in cluster farming helps to improve my dressing habits.					

APPENDIX II

FGD Questions

1. How do you evaluate the cluster farming practice in your kebele_____
2. What do you evaluate the achievements of cluster farming in increasing productivity as well as biomass of the products_____
3. How do you evaluate the farmers union is your kebele Interms of
   A. Its capacity in buying your product.
   B. Its fair price to your product
   C. Its timely purchasing of your product
   D. Its internal staff as well as infrastructures capacity
4. Do you get all the required modern input based on your request? Interms of timely availability? Amount availability and fair Prices?
5. What do you advises other to be involved in cluster farming and to stay within the cluster_____
6. Have you seen any negative or positive impact of cluster farming on the local environment? If yes, please mention them? And what do you recommend as a solution? _____
7. What is the change in your and your family's life after you involvement in cluster farming?_____
8. What are the major challenges for farmers not to participate in cluster farming? And what do you think the solution for these Challenges _____?
9. What kind of challenge do you face while practicing cluster farming? And what do you think the solution would be_____?

APPENDIX III

Interview Questions for DA and Woreda Experts.

1. How do you evaluate the cluster farming practice in your woreda as well as in the study kebele_____
2. What is the contribution of the cluster farming in your woreda in general and in the study kebele in particular? _____

3. Do you think the Cluster farming has improved the life of the people in your woreda as well as in the study kebele? If yes, how_____

4. Did the farmer union or the woreda Bureau of Agriculture you supply all the required modern inputs to the farmers based on their needs and on timely and fair price? If not what do you think the problem and the solution would be?

5. Do farmers in your woreda as well as in the study kebele use machineries (combiner, harvester etc.)? If yes please explain how do farmers use the machine? From where they get it? How do you link them with the machine owners? If no what do you think the reason would be? And how can you advise farmers to use this modern machine which save time and energy?

6. Is there a market linkage created between farmers and industry owners to sell their product with a better price? If yes, explain it. If no what is the reasons and how do you think about the solutions?

7. How do you evaluate the farmers' union strength and accessibility to purchase the farmers product with fair price on timely bases?

8. Do the life of farmers participated in cluster farming changed? If yes, tell me some of changes?

9. What are the challenges that affect the implementation of cluster farming in the woreda as well as in the study kebeles? What do you think the solution for these challenges?

10. Have you ever come across on the effect of cluster farming to the local environment, if yes? Please mention some of them and please suggest the solution for these?

APPENDIX IV

Addis Ababa University

College of Development Studies

Centre of Environment and Sustainable Development

A Questionnaire for Sample non participated farmers in Cluster farming.

Dear respondent, I am studying my MA in Environment and Sustainable Development in Addis Ababa University. Now I am working my thesis and the purpose of the research is to investigate the contribution of cluster farming to the livelihood of the farmers at SIYADEBRINA Wayu woreda, North Shewa, Ethiopia. As a researcher I am kindly requesting you to give your genuine answers without any hesitation for the below questions. Your genuine responses are preconditions for this research to attain its goal. It is only based up on your own consent to respond the questions. Therefore, please feel free to respond to the questions to the best of your knowledge.

Thank you in advance for your collaboration!

Date of interview _____.

I. **Personal details of Respondent**

1. Code _____2. Age _____ 3. Sex _____ 4 Kebele._____

5.Gote/ Village/_____6. Marital status: _____7. Level of education: _____

8. Total number of the family in your household _____

9. Amount of cultivated (hectare) land for all crops_____

10. Amount of cultivated land (hectare) for wheat_____

Main questions. (Non-Participants farmers)

1. Why didn't you participants in cluster farming?

   A. I didn't get awareness on it. B. I have very small plot of land C. I didn't have a capacity to buy inputs. C. mention other if any

2. How do you evaluate the difference in the amount of production per hectare of yours and your neighbors who participated in cluster farming?

   A. Very high B. high C. there is no difference

3. If the change is very high and high, what do you think the reason for the participant's farmers to get more production than you?
4. Amount of wheat produced per hectare of land in Quintals_____.
5. Amount of biomass/Hey/ you get from the wheat farm_____.
6. Is there a difference in the amount of Hey /biomass/ between yours and your neighbors who participated in cluster farming? _____.
7. If there is an increase in the amount of bio mass/hey/ what do you think the reason would be?_____
8. Can you access fertilizers, improved seeds, herbicides and insecticides from the union in a credit form?
9. What is the amount of fertilizers you used for your wheat production?

   A. Urea_____quintals B. Dap_____ quintals C. Others_____

10. What is the amount of Improved seed you used for your farm_____?
11. Is there a difference in the amount of fertilizers you used and participants farmers used? If yes what do you think the reason
12. Have you ever machine to plough or harvest your production? If No why?_____
13. What are the major factors that challenges you not to be involved in cluster farming_____

No	Issues	Likert scale				
		Strongly disagree (1)	Disagree (2)	Undecided (3)	Agree (4)	Strongly Agree (5)
1.	My involvement in cluster farming helps to increase my production					
2.	My involvement in cluster farming helps me to increase the amount of biomass I gain from.					
3.	My involvement in cluster farming helps me to build a separate house for my cattle.					
4.	My involvement in cluster farming helps me deposit money					
5.	My involvement in cluster farming helps me to send my children to school					
6.	My involvement in cluster farming helps to improve mine and my families feeding habits.					
7.	My involvement in cluster farming helps to improve my dressing habits					

APPENDIX V

Discussion Questions for the Famer union

1. What kind of items do you have sold to the farmers? -
   _____
2. How do you evaluate your Human resources and material resources?
   _____
3. Do you sell your products to the cluster farmers and BAU farmers on equal bases by cash and credit?
   _____
4. How your union is preferable than the local market to the farmers in selling their products to you?
   _____
5. What are the major internal and external challenge you face in your daily business_____

APPENDIX VI

Addis Ababa University

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