

**IMPACT OF PRODUCTIVE SAFETY NET PROGRAM ON RURAL HOUSEHOLD  
DIETARY DIVERSITY AND WEALTH: THE CASE OF MISHA WOREDA HADIYA  
ZONE, SOUTHERN REGION, ETHIOPIA**

**MSc THESIS**

**BY**

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**Impact of Productive Safety Net Program on Rural Household Dietary Diversity and Wealth: The Case of Misha Woreda, Hadiya Zone, Southern Region, Ethiopia**

**By**

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**A MSc Thesis**

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**Co-advisor: Ermias Melaku (Assistant Professor)**

**December 2018**

**Jimma, Ethiopia**

## **DEDICATION**

I dedicate this thesis manuscript to my daughter Mishame Solomon, my beloved husband Solomon Erjabo and all of my family members for their continuous contribution throughout my life.

## STATEMENT OF THE AUTHOR

First of all, I declare that this thesis is my exclusively work and that all sources of materials used for this thesis have been properly acknowledged. This thesis has been submitted in partial fulfillment of the requirements for M.Sc. degree at Jimma University and to be made available at the university's library under the rules of the library. I seriously declare that this thesis is not submitted to any other institution anywhere for the award of any academic degree, diploma or certificate.

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## **BIOGRAPHICAL SKETCH**

The author was born on June 6, 1991 in Misha Woreda, Hadiya Zone, from her father Leimango Bulamo and her mother Arfo Ugusso. She completed her elementary education at Dangewura Elementary School in 2003 and Junior Secondary School at Alemu Wolde hana 2005. She attended high school education at Yekatit 25/67 (2006-2007) and she attended her preparatory education in Wachamo Comprehensive and Preparatory school in (2008 - 2009). After passing Ethiopian Higher Education Entrance Qualification Examination, she joined Hawassa University in 2010 and graduated with B.Sc. degree in Agricultural Resource Economics and Management (AREM) in 14 July 2012.

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## LIST OF ABBREVIATION AND ACRONYM

CFI	Chronically Food-insecure
FAO	Food and Agriculture Organization
FSP	Food Security Program
FSS	Food Security Strategy
GDP	Gross Domestic Product
HABP	Household Asset Building Program
HDDS	Household Dietary Diversity Score
HEP	Household Extension Program
HH	Household
MOFED	Ministry of Finance and Economic Development
MoLSA	Ministry of Labor and Social Affairs
MORAD	Ministry of Agriculture and Rural Development
OFSP	Other Food Security Program
PASDEP	Plan for Accelerated and Sustained Development to End Poverty
PSM	Propensity Score Matching
PSNP	Productive Safety Net Program
PW	Public Works
SNNPR	Southern Nation Nationalities People Region
USD	United State Development
WB	World Bank
WFP	World Food Program

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FOOD SECURITY AND ASSET BUILDING: THE CASE MISHA WOREDA,  
HADIYA ZONE, SOUTHERN, ETHIOPIA**

**ABSTRACT**

*Chronic food insecurity is one of the main problems which affected millions of Ethiopians for centuries. To solve this problem, the government of Ethiopia has been undertaking different programs including Productive Safety Net Program. This study was conducted to evaluate the impact of productive safety net program on households' food security and asset building in Misha Woreda of Hadiya Zone, Southern Nations Nationalities and People's region, Ethiopia. It was intended to identify the factors affecting participation in productive safety net program and evaluate impacts of Productive Safety Net program on household food security and asset building. A two stage sampling technique was employed to select 155 households from four kebeles. Both primary and secondary data sources were used in the study. Primary data was collected from household heads through semi-structured interview schedule. In addition, data collected from different secondary sources were used. Data was analysed by using both descriptive statistics and Propensity Score matching method. Results from descriptive statistics indicated that program beneficiary households' asset and dietary diversity intake have increased due to program participation. The logistic regression estimation of Propensity Score Matching result showed that age of household, dependency ratio, education level, land size, off/non-farm income, sex of household head, and livestock ownership were the variables that significantly affected the participation of households in Productive Safety Net Program. Furthermore, the impact estimation result showed that, the program intervention had positive and significant impact on household food security and asset building as participating households' dietary diversity intake on average increased by 31% and the asset increased by 38%. Thus, the study suggests that the program should be encouraged by the government and other concerned bodies' in order to benefit other non-participant resource poor households in future.*

**Keywords:** Impact, Logistic Regression, Program Beneficiary, Propensity Score Matching.

# 1. INTRODUCTION

## 1.1. Background of the Study

Enough food in terms of quantity and quality for all people is an important factor for a nation to continue its development. In today's world food insecurity, malnutrition and hunger would remain the main agenda and much more serious problems (Sila and Pellokila, 2007). The United Nation Food and Agriculture Organization estimate that about 805 million people of the 7.3 billion people in the world or one in nine were suffering from chronic undernourishment in 2012-2014. Almost all the hungry people 791 million live in developing countries, representing 13.5 percent or one in eight of the population of developing countries and there are 11 million people undernourished in developed countries (FAO, 2014).

Sub Saharan Africa remains the region with the highest prevalence of undernourishment, with modest progress in recent years. Frequent droughts, growing expenditure on food production and imports, falling export earning and rapid population growth have been cutting into living standards and growth prospects. The effect has been pervasive, not only on incomes of agricultural producers, who include most of Africa's poor, but also on supplies of food and raw materials for industry, on employment, savings, government revenue, and on the demand for goods and services produced outside agriculture. Yet policy changes and planning for resumption of growth in agriculture are hampered by a serious lack of country-specific information. Reform efforts all too often try to apply general remedies to Africa's diverse problems. In all the SSA countries, population growth has put intensive pressure on agricultural land and the size of land holding is inadequate to produce enough food for the whole family. As a result, population pressure has brought increasingly marginal land into cultivation, which possibly affects statistics on average yield per hectare. The need to increase land and labor is becoming urgent (Khushet *al.*, 2012).

Ethiopia's economy is highly dependent on agriculture and related activities. Agriculture alone contributes 38.8% to the total gross domestic product (GDP), while share of GDP has been declining steadily over the past decade. It provides livelihood to about 85% of the population, constitutes more than 70% of the nation's total exports, and provides most of the

foreign exchange earnings to the economy (NBE, 2014/15). Agriculture is also a main source of raw materials for industries. On the other hand, in spite of its great significance in the Ethiopian economy, the performance of the agriculture sector still has been miserable. Growth in agricultural production has stagnated over the last five years (Porter, 2010).

Factors contributing for the poor performance of agricultural sector, among others include, frequent drought, extreme fluctuations of rains, low levels of agricultural technology generation and utilization, population growth and land degradation in the form of soil erosion, loss of soil fertility, salinization and moisture stress(Adimassu, 2012). This low performance of agriculture resulted in majority of farm households to be food insecure and live under poverty (Temesgen, 2014). According to MOFED (2012), the proportion of poor people (poverty head count index) in the country was estimated to be 29.6% in 2010/11. In 2010/11, while the proportion of the population below the poverty line stood at 30.4% in rural areas, it is estimated to be 25.7% in urban areas. The poverty gap index is estimated to be 7.8% while it is 8.0% for rural areas and 6.9% for urban areas. Similarly, the national level poverty severity index stood at 0.031 with rural poverty severity index (0.032) being slightly higher than that of urban areas (0.027).

Accordingly, the Government planned policies, which are people-centered and geared towards addressing the needs of the poor in terms of providing better social services as well as attaining a higher economic performance at the macro level. This is viewed by its commitment to achieve the millennium development goals (MDGs) and by its strong poverty reduction program involved in the sustainable development and poverty reduction program (SDPRP) and in the plan for accelerated and sustained development to end poverty (PASDEP) (as cited Hermela, 2015).

The number of people who were food insecure and desperately needed safety net response reached its peak in 2002-2003 when thirteen million Ethiopians were affected by drought (Mundial, 2010). Thus, at the times of food shortages, the Ethiopian government used to call for help and notify the emergency food needs of the country to the international donors. The donors include Canadian International Development Agency (CIDA), United States Agency for International Development (USAID), World Bank (WB), and several European donors



initiated a new social protection program known as the Productive Safety Net Program (PSNP).

As a result, government led country wide Productive Safety Net programs were started in 2005. Initially 4.8 million chronically food insecure people were targeted in 192 food-insecure woreda in six regions: Amhara, Oromia, SNNPR and Tigray as well as Dire Dawa and Harari regions. Since January 2008, PSNP has also involved a pilot pastoral program in Afar, Oromia, SNNPR and Somali regions (Mulugeta, 2014). Productive Safety Net Program (PSNP) is clarified in the policy as one of the food security and asset building programs designed to protect food insecure households through transfer of cash and food items during times of shocks and stress due to famine, drought and other natural hazards. Moreover, the program protects poor households from selling and depleting their productive assets during these shocks and allows poor households to build assets and to empower them to increase their productivity (MoLSA, 2012; Fisseha, 2014).

According to MoARD (2010), Ethiopia has intended and implemented food security strategies since 1996 in order to address food insecurity problems through households' asset building and improving availability and access for food to the poor people in the areas designated as chronic food insecure areas country wide. Southern Nation Nationalities and People Region is one of the regions out of the nine Administrative states of the country and 78 chronically food insecure woredas in the region were included in the program. Hadiya Zone is one of thirteen Zones and eight special Woredas in the region. Misha woreda is one of food insecure and PSNP target woredas since 2005 (SARDB, 2010). However, since the initiation of the program the number of households in need of PSNP support is increasing from time to time. According to Misha Woreda office of Agriculture and Natural Resource report (2017) PSNP benefited 10812 households through public work and 1185 households through direct support.

Under this program, both Governmental and Non-governmental Organizations (NGOs) are implementing towards food security and asset building. However, the question is, do these food security and asset building programs have an impact in improving the outcome of interest of participating households? And how much have they benefited? This study therefore provides

information on these basic issues as such informations are relevant for program administrators, policy makers, development actors and others.

## **1.2. Statement of the Problem**

Ethiopian agriculture is dominated by resource poor farmers who primarily produce for subsistence. Chronic food insecurity has been a defining feature of poverty that has affected millions of Ethiopians for years. The vast majority of these extra ordinarily poor households live in rural areas that are heavily reliant on rain fed agriculture and thus, threat of wide spread starvation is high. Since the tragic 1983-84 famine, the policy response to this threat has been a series of ad-hoc emergency appeals for food aid and other forms of emergency assistance. While this have succeeded in preventing mass malnourishment, especially among the asset less, they have not banished the threat of further famine and they did not prevent asset depletion by marginally poor households affected by adverse rainfall shocks. As a result, the number of individuals in need of emergency food assistance rose from approximately 2.1 million people in 1996 to 13.2 million in 2003, before falling back to 7.1 million in 2004 (WB, 2004).

Ethiopia's PSNP, is one of the largest social protection programs in Africa that has been implemented since 2005 to assure food consumption and prevent asset depletion for food insecure household in chronically food insecure Woredas, while stimulating markets, improving access to services and natural resources, and rehabilitating and enhancing the natural environment. The rural poor work on productive activities, which are contributing to food security through environmental and natural resource friendly public works of the program and sometimes benefited through direct transfer when necessary.

Misha is one of the chronically food insecure and vulnerable district of Hadiya Zone in SNNPR. The district experiences frequent crop failure and vulnerable to food shortage. It has been assisted by relief frequently to overcome the challenges and to cope up with poor situations, which are the consequences of environmental degradation, socio-economic and demographic imbalance. To overcome chronic food insecurity situation which is pervasive in the Woreda, PSNP was implemented as part of the country at large program.

Some empirical studies have been conducted to examine the impact of PSNP on household food security and asset building in different areas. There is some positive significant impact of PSNP on rural households' food security and asset building. Among these studies, for instance, Temesgen (2014) evaluated the impact of the Ethiopian PSNP on farm households' food security and asset building in Alaba Special Woreda of SNNPR and found that program participation increased food consumption, but the program hasn't brought a significant change on the total asset value of the program households. Similarly; Mulugeta (2014) evaluated the impacts of PSNP on rural household food security and asset holding in Gurgura District, Dire Dawa Administration. His finding also implies that the program has positive impact on participants' food security and asset.

To generalize the impact of PSNP on HHS food security and asset based these specific studies, the findings doesn't take in to account situation where the livelihood of the district is different from other areas. PSNP in the district is the intervention that is receiving most attention and resources right now. But these investments in farming and small enterprises effects are limited by the depth of poverty and food insecurity within recipient households, by the low value and erratic disbursement of PSNP transfers. There are no empirical evidences whether or not the program efforts have the intended effect on food security and asset building in the study area. Research based adjustments on the program have not been made, lessons have not been identified and documented on the implementation as well no research based impact evaluation of the program came out in specific to Misha district. Therefore, generally this study attempted to evaluate the impacts of productive safety net program on households' food security and asset building in Misha district.

### **1.3. Research Questions**

1. What are the factors affecting participation in productive safety net program in the study area?
2. What is the impact of productive safety net program on rural household food security in the study area?
3. What is the impact of productive safety net program on household asset building in Misha district?

## **1.4. Objectives of the Study**

### **1.4.1. General Objective**

The general objective of this study was to assess the impact of productive safety net program on rural household food security and asset building in Misha district, Hadiya Zone, SNNPR.

### **1.4.2. The specific objectives**

1. To identify the factors affecting participation in productive safety net program.
2. To evaluate the impact of PSNP on rural households' food security in the study area.
3. To evaluate the impact of PSNP on rural households' asset building in Misha district.

## **1.5. Significance of the study**

Evaluating the impact of productive safety net program is particularly critical for developing countries because the resources we are using are scarce and every dollar spent should aim to maximize its impact on poverty reduction. The findings of the study would give some feedback on effectiveness of the program that to know how much the program has achieved its stated objectives. This study designed to provide an evaluation of the impact of PSNP on the food security and asset building of the beneficiaries and to provide critical input to the appropriate design of future programs and projects. In other words, this study will contribute to the understanding of the impact of PSNP on households food security and asset building for different stakeholders and as well as for anyone who want to use it. In addition, it will inform both to the policy makers and implementers how to achieve success in the area of food insecurity reduction using the program. Moreover, it might give planners and policy makers better insight to adjust any deviations on the program implementation as it moves forward besides serving as starting point for researchers who might have interest to do further assessment in the study area.

## **1.6. Scope and Limitations of the Study**

This study focused on Misha district of Hadiya zone. So, it may be difficult to extrapolate the findings to other places as the performance of the productive safety net program can differ from place to place. The program has been operating in all 32 kebeles for selected households

in the district. As such, this enabled to choose comparison households for the study from the same kebeles. Though there were many kebeles where program activities have been undertaken in the district, four of them were included to the sample due to time and resource constraints. Even if PSNP has various target dimensions; to assure food consumption, prevent asset depletion for food insecure households, stimulating markets, improving access to services and natural resources, and rehabilitating and enhancing the natural environment. But this study was limited on its effect on food security and asset building. Additionally, the study was also conducted with some methodological limitations. This is the absence of baseline survey data for impact evaluation of household food security and asset building status before and after program implementation.

### **1.7. Organization of the Thesis**

This thesis is organized into five chapters. The first chapters introduce the background of the study, statement of the problem, research questions, objectives, significance of the study and scope and limitation of the study. The second chapter covers relevant literature review. The third one deals with the research methodology. The findings of the study were presented and discussed in the fourth chapter. Finally, chapter five deals with summary, conclusions and recommendations of findings.

## **2. LITERATURE REVIEW**

### **2.1. Definitions and Concepts on Food Security and Asset Building**

The main concern of food security in the mid of 1970s focused on national and global food supplies. In the 1980s, the suffering had become narrower than before and pressure was given to demands of access to food at household and individual level (Maxwell and Smith, 1992).

#### **2.1.1. Food Security**

Food security is defined in different ways. A recent review on food security has found about 200 such definitions (Hoddinott, 2001). The most commonly used definition has been that developed by the World Bank (2009), when all people at all times have both physical and economic access to sufficient food to meet their dietary needs for a productive and healthy

life. By definition, food security is a broad and complex concept, determined by a range of factors agroecological, social and economic factors. For this reason, there is no single direct measure of food security. Instead, the general concept of food security is dividing in to distinct dimensions (scopes): Food availability, food access and food utilization (USAID, 2002).

‘Food security’ is a flexible concept and is usually applied at three levels of aggregation: national, regional and household or individual. At the 1996 World Food Summit, food security was defined as: ‘Food security exists when all people, at all times, have physical, social and economic access to sufficient food which meets their dietary needs and food preferences for an active and healthy life’ (FAO, 2010). This definition is well accepted and widely used. The four core determinants of food security are:

**Food availability:** Is achieving sufficient quantities of food consistently available to all individuals with in a country. Such food can be supply through domestic output, commercial imports and existing (Jradet *al.*, 2010).

**Food access:** Household food access is the ability to obtain sufficient food of guaranteed quality and quantity to meet nutritional requirements of all household members. Here, the food should be at right place at the right time and people should have economic freedom or purchasing power to buy adequate and nutritious food (Jradet *al.*, 2010).

**Food utilization:** Is proper biological use of food requiring a diet providing sufficient energy and essential nutrients with drinkable water, and sufficient sanitation (Rielyet *al.*, 1999).

**Food Stability:** Refers to the continuous supply of adequate food all year round without shortages (Jradet *al.*, 2010). To be food secure a population, household, or individual must have access to adequate food at all times. They should not be at risk of losing access to food as a consequence of a shock (e.g., an economic or climatic crisis), or cyclically (e.g., during a particular period of the year, seasonal food insecurity). The concept of stability can therefore refer to both the availability and access dimensions of food security.

Basically, the household food insecurity theory distinguished between the two closely tangled theories, chronic and transitory insecurity. The PSNP program Implementation Manual (MoARD, 2010), defined the two concepts as follows:

**Chronic food insecurity:** Households that are regularly unable to produce or purchase enough food to meet their food needs, even during times of normal rain, are considered chronically food insecure. The PSNP recognizes that the emergency responses to chronic food insecurity are not the effective mechanism, because the same people require the same levels of support each year. What is needed is a more developmental approach that assists people to overcome their poverty and become food secure. The PSNP delivers timely, predictable and appropriate transfers to assist this process.

**Transitory food insecurity:**Is come about as a result of shocks due to economic failures and human induced as well as natural disasters creating food shortages that affect, temporarily, all or part of the country's population (MoARD, 2010).

### **2.1.2. Household asset**

Asset is in accounting term, the resource owned excluding liability. In the farming household context, asset includes all livestock owned, productive assets and consumer durable assets that belong to the household. Although there is a variation in owning of these assets in Ethiopia, they can be listed as follows:

**Livestock assets:** include cattle, sheep and goats, poultry and equines.

**Productive assets:** include all asset used to produce crop and livestock like plough equipments, water pump, sickle, spade, beehives, cart, pick axes and axes.

**Consumer durable assets:** include telephone, radio, bed, home, bicycle and other cooking materials, etc. Household asset accumulation means increasing the real value of all types of assets of the household over a specified reference period. The specified period is usually the period of time for which a program or an intervention that is expected to bring asset accumulation is implemented.

## **2.2. Measurement of Food Security**

### **2.2.1. Indicators and Measurement of Food Security**

Food security indicators are classified in two major categories: process and output indicators. Process indicators are used to measure the changing status of food security and are two main types called supply and access indicators (Frankenberger, 1992 as cited in Temesgen, 2014). Supply indicators measure the availability of the food, most conventional assessments of security, including famine early warning systems. Access indicators measure peoples' access and entitlement to food, through own production, purchases, transfer or gifts. There are various means or strategies used by households to meet their household food security needs which includes risk-minimizing plans like multiple cropping, intercropping, diversifications of livestock and diversification of income sources. Outcome indicators, unlike the supply indicators, measure states of food security at a given point in time.

Food security at household level is measured by direct surveys of dietary intake in comparison with appropriate adequacy norm. However, it measures existing situation and not the down side risks that may occur. The level of, and changes in, socio-economic and demographic variables such as real wage rates, employment, price ratio, and migration if properly analyzed, can serve as proxies to indicate the status of and changes in food security (Mulugeta,2014). Income or consumption has been traditionally used as measures of material deprivation. Food consumption is better to reflect household's ability to meet their basic needs. Income is one of the factors that enable consumption, though consumption also reflects a household's access to credit and saving at times when their income is too low (MoFED, 2002).The other bestfood security measurement toolor indicator isdietary diversityscore.Itis defined as the number of different foods or food groups consumed over a reference period, not regarding the frequency of consumption. It refers to the variety of foods consumed by individuals or households (Hoddinott and Yohannes, 2002). Consequently, dietary diversity score (DDS) which quantifies the number of food groups in a diet consumed over a reference period emerged as a potential indicator of nutritional adequacy (FAOUN, 2007). It is differentiated as household dietary diversity score (HDDS) and individual dietary diversity



score (IDDS), including child dietary diversity score (CDDS) and women dietary score (WDDS) (FANTA, 2006).

The Household Dietary Diversity Score (HDDS) is a frequently used indicator of food security. It was developed to measure household food access, one of the levels of food security and is meant to reflect, in a snapshot form, the economic ability of a household to access a variety of foods. Studies have shown that an increase in dietary diversity is associated with socio-economic status and household food security (household energy availability) (Hatloyet *al.*, 2000). The dietary intakes of the study population were assessed using the 24-hour dietary recall method (Drewnowski *et al.*, 1997; Gibson, 2005). The following set of 12 food groups is used to calculate the HDDS.

- |                            |                         |
|----------------------------|-------------------------|
| i. Cereal                  | vii. Oil/fats           |
| ii. Root and tubers        | viii. Fruits            |
| iii. Fish and seafood      | ix. Eggs                |
| iv. Pulses/legumes/nuts    | x. Meat, poultry, offal |
| v. Vegetables              | xi. Sugar/honey         |
| vi. Milk and milk products | xii. Miscellaneous      |

The scores were counted from each food group and summed up and HDDS were calculated based on the FAO guidelines for measuring household and individual dietary diversity. A DDS of less than three food groups was regarded as low household dietary diversity and hence food insecure. Four to five food groups were regarded as medium dietary diversity and greater than or equal to six ( $\geq 6$ ) food groups were regarded as high dietary diversity hence food secured (Hadijah *et al.*, 2016). As a result, the multicountry analysis, which demonstrated the potential usefulness of household dietary diversity as an indicator of food security (defined in relation to energy availability), has important programmatic implications, because diversity is so much easier and cheaper to use than traditional measures of food security, which usually involve the collection of complex quantitative information (Ruel, 2003). Therefore, this study used HDDS for measuring households' food security.

### **2.3. Food Security situation in Ethiopia**

Ethiopia is the second most populous country in Africa with an estimated population of 94.3 million people in 2013. As indicated by Africa Food Security and Hunger/ Undernourishment Multiple Indicator Scorecard, Ethiopia ranked as first in having the highest number of people in state of undernourishment/ hunger which is 32.1 million people. This makes it, the fourth African country scoring (37.1%) of the population being undernourished/ in hunger. The livelihoods of rural Ethiopian people are highly sensitive to climate (as cited Mohamed, 2017).

Many factors are contributing to trap Ethiopia in the current state of food insecurity and poverty. These include production fluctuations, low non-farm employment, low income, regional fragmentation of markets, high rate of natural degradation, low level of farm technology, high level of illiteracy and inadequate quality of basic education, poor health and sanitation, high population growth, poor governance and inter-state, intra-state military conflicts and wars. These factors obstruct the achievement of food security and sustainable economic development. It has one of the lowest per capita incomes in the world and high occurrence of absolute poverty with 50% of the population below the poverty line (Asefa, 2003).

Ethiopia could potentially reach middle-income status by 2025 with an emphasis on boosting domestic savings rates, private sector development and improving the trade logistics, according to the World Bank (Endalewet *al.*, 2015). However, poverty is still a big obstacle to overcome in Ethiopia. Nearly one third of the population lives below the poverty line and avast majority depends on subsistence agriculture. Consequently, chronic and acute food insecurity is prevalent, especially among rural populations and smallholder farmers. About 10% of Ethiopia's citizens are chronically food insecure and this figure rises to more than 15% during frequent drought years. 2.7 million People will require emergency food assistance in 2014 and 238,761 children require treatment for severe acute malnutrition in 2014 (UNICEF, 2014).

Favorable food security conditions prevail in most parts; however, over 7.1 million people were estimated to live in conditions of crisis and emergency in November 2013. These

populations are in North Eastern Amhara, Eastern Tigray and Eastern Oromia in Ethiopia (WFP, 2014). The number of children with severe acute malnutrition in Afar, Amhara, Oromia, Southern Nation Nationality Peoples region, Somali and Tigray regions showed a slight decrease from 21,566 (86.2% reporting rate) to 21,105 in 2014 (84.4% reporting rate). As compared to 2013, this year's rate is lower by 10.7%, indicating an improved food security situation in 2014 (UNICEF, 2014).

#### **2.4. Food Security Programs in Ethiopia**

The objective of the Plan for Accelerated and Sustained Development to End Poverty (PASDEP) is to define the nation's overall strategy for development; to lay out the directions wants to take, with the ultimate objective of eradicating poverty; and to outline the major programs and policies in each of the major sectors. In Ethiopia, the PRSP process started in 2000 and the PASDEP is now considered a national plan for guiding all development activities during the five years planned period. Equally importantly, it is a nationally arranged development plan belonging to all Ethiopians, developed through a process of consultation among all elements of society (as cited Aman, 2013).

Ethiopia's Food Security Strategy (FSS) issued in November 1996, highlighted in the government plan to address causality and effect of food insecurity in Ethiopia (FDRE, 1996). The regional food security programs and projects were consequently designed on the basis of this strategy. The revised food security strategy of the country was developed in 2002 which updated the original 1996 FSS by sharpening the strategic element to address food insecurity (Mamo, 2011).

According to Temesgen (2014) the government made significant changes to its Food Security Program (FSP), scaled up the level of intervention and incorporated a large Productive Safety Net Program (PSNP). Therefore, from the year 2005-2009 FSP was designed to help chronically food insecure households reach an intensity of food security necessary for an active and healthy life. There were three components planned under the FSP (2005-2009): Resettlement, Productive Safety Net Program (PSNP), and on the other hand Food Security Program (OFSP/HEP). Resettled households were estimated to achieve food secure status solely as a result of the component's package of intervention. Safety net beneficiaries,

however, would require complementary other food security interventions (mainly the HEP/HABP) in order to achieve sustainable food security. The first phase of five year FSP was implemented from 2005 through 2009.

The food security program has three main components, which together are designed to attain household food security over a five year period: The Productive Safety Net Program with two sub components—Public Works (PW) and Direct Support (DS)—which bridges food gaps with cash or food transfers while building community assets; Household Extension Packages, which support a range of non-farm livelihood activities; Voluntary Resettlement Program, which relocates people from the most vulnerable highland communities to more productive land in terms of the World Bank's social risk management terminology (Fitsum,2013). Similarly, Aman (2014) showed, the food security program intends to increase the availability of food through increased domestic production; to ensure access to food for food deficit households; and to strengthen emergency response capabilities and the key interventions designed to attain household food security as following.

**Household Asset Building:** Building and sustaining household assets, which the rural households are repeatedly losing because of drought remains the underlined issue. For this effect, appropriate technologies such as provision of improved inputs to enhance livestock and crop productivity, moisture conservation and utilization, natural resource development, training, support for additional income generating.

**Voluntary Resettlement Program:** To rationalize resource use and by this means help the food insecure households and exit from food poverty, the Federal and Regional Governments are supporting voluntary resettlement as part of its food security program.

**Non-agricultural Income:** Income diversification through promoting non-agricultural activities is of paramount importance to ensuring food security.

## **2.5. Productive safety net program**

One of the social protection programs designed to protect the Ethiopian population is productive safety net program. Ethiopia's PSNP is the largest social protection program operating in sub-Saharan Africa outside South Africa with three basic objectives such as

smoothing food consumption in chronically food insecure households by transferring food or cash (as protection intervention); Protecting household assets by avoiding damaging coping strategies such as selling productive assets or taking on high-interest loans to buy food (as prevention intervention); Building community assets by selecting public works activities that create infrastructure with development potential (as promotion intervention) (MoARD, 2010).

According to Andersson *et al.* (2011), PSNP is a public program through which food-insecure people are employed in public work for five days a month during the agricultural slack season. This is intended to enable households to smooth consumption so that they will not need to sell productive assets in order to overcome food shortages. The public work is also intended to create valuable public goods; moreover, by reducing seasonal liquidity constraints, it is intended to stimulate investments as well. The Program is wider and core component of the Government of Ethiopia's Food Security Program which aims to ensure that 'Food security status for male and female members of CFI households in CFI woreda enhanced'. This outcome of the FSP is the goal of the PSNP. In making progress towards achieving this goal, the program also expects to make a contribution towards the overall Goal of the Food Security Program: "Food security for chronic and transitory food insecure households in rural Ethiopia achieved" (MoARD, 2009).

The program main aim is to reduce the number of people who rely on annual humanitarian appeals, by providing predictable and timely cash and food (DFID, 2007). It aims to shift away from a focus on short-term food needs met through emergency relief to addressing the underlying causes of household food-insecurity. The PSNP, started in 2005, has been supporting 7.2 million Ethiopians who are vulnerable to shocks such as droughts and floods. The program tries to reduce the vulnerability of households that do not have enough to eat even when the weather and harvest is good (FAO, 2006).

The PSNP has special features such as: types of transfers, specific objectives, basic principles, basic components and targeting principles. The type of transfer may be cash only, both cash and food or food only based on specific situation of the safety net areas. The specific objectives of the cash and food transfers provided through the PSNP are: (1) to smooth household consumption – to bridge production deficits in chronically food insecure farming households that are not self-sufficient, even in good rainfall years; (2) to protect household

assets- to prevent poor households from falling further towards destitution, vulnerability to future shocks and chronic dependence on external assistance; and (3) to create community assets- by linking the delivery of transfers to activities that are productivity-enhancing, in order to promote sustainable developmental outcomes (FDRE, 2006).

### **2.5.1. Targeting and eligibility for Productive Safety Net Program**

Targeting under the PSNP is a combined administrative and community approach. The eligibility for the PSNP Woreda and Kebeles were defined by the frequency with which they required food assistance in the ten years preceding the design of the program. This period has now been reduced to three years. Within food insecure Woreda, the selection of chronically food insecure households (beneficiaries for both the public work and direct support components) uses a mix of administrative guidelines and community inputs. Households should be members of the community. The food gap is defined as the number of months in the last 12 months that a household report it had difficulty in satisfying its food needs. Households which suddenly became more food insecure as a result of severe loss of assets and which are unable to support themselves (in the past 1-2 years) are also eligible. Any household without family support and other means of social protection and support is eligible. Additional factors to be considered for targeting by the PSNP are: Status of household assets (land holding, quality of land, food stocks, labor availability etc.); Income from agricultural and non-agricultural activities; Support/remittance from relatives or community and specific vulnerabilities such as femaleheaded households, households with members suffering from chronic illness, such as AIDS, elderly headed households caring for orphans, etc (MoARD, 2010).

### **2.5.2. Graduation**

The objective of the PSNP program is to help households smooth their consumption and make productive household and community assets by providing public works and different asset creation activities. The Ethiopian government has recognized that while this is clearly a necessary condition for promoting a sustainable solution to food insecurity by providing a much-needed stabilizing environment. Another way to look at the PSNP program objective is to think in terms of graduation. The program aims to put CFI households on a trajectory of

asset stabilization first, then asset accumulation. That is, a series of inputs from the program and from other development interventions makes households become food sufficient first, then sustainably food secure (Aman, 2013).

According to Hermela (2015) “Graduation” is referred in program implementation manual (PIM) as a group of a household out of the beneficiary of PSNP. Over the years, it is expected that the food security condition of the households will improve with the help of PSNP. A household is well thought-out as a prospect graduate when it meets its food needs for all 12 months of the year and able to withstand modest shocks.

The program assesses the circumstances of the households every year to determine whether they have reached the criteria for graduation. The assessment involves insuring if families have assets such as land holding, livestock holding, food stock, etc. These criterion are benchmarks that are used in all regions to decide graduation. Actually, they rely on assessment of a small number of proxy indicators, including livestock holdings, land holdings and education status to determine food security status. Graduation from the PSNP is expected to reduce overall client numbers over time. Households that are identified for graduation will remain in the PSNP for one additional year to promote stability in their livelihoods and the building of resilience (Ministry of Agriculture, 2010).

## **2.6. Impact Evaluation Methods**

The productive safety net program impact evaluation review the effect of an intervention on final welfare outcomes, rather than the program implementation process. More generally, program impact evaluation establishes whether the intervention had a welfare effect on individuals, households, and communities, and whether this effect can be attributed to the concerned intervention.

To know the effect of a program on a participating individual, we must compare the observed outcome with the outcome that would have resulted had that individual not participated in the program. However, as stated earlier two outcomes cannot be observed for the same individual. In other words, only the factual outcome can be observed. Thus, the fundamental problem in any social program evaluation is the missing data problem (Ravallion, 2005; Bryson *et al.*, 2002).

According to Omoto (2003), the term impact refers to the wide and long-term economic, social and environmental effects of an intervention resulting in anticipated or unanticipated, and desired or undesired outcome, at the individual or the organizational level that involve changes in both cognition and behavior.

According to Baker (2000), there are two main approaches in impact assessment. These are randomized (experimental) designs and quasi-experimental (non-randomized) designs.

### **2.6.1. Experimental (randomized) method**

In a randomized experiment, the treatment and control samples are randomly drawn from the same population. In other words, in a randomized experiment, individuals are randomly placed into two groups, namely, those that receive the program or intervention and those that do not get the program service or intervention. This allows the researcher to determine program impact by comparing means of outcome variable for the two groups.

According to (Ezemenariet *al.*, 1999), a random assignment of individuals to treatment and non-treatment groups ensures that on average any difference in outcomes of the two groups after the intervention can be attributed to the intervention. The main advantage of a randomized experiment is its ability to avoid problem of selection bias, which arises when participation in the program by individuals is related to their unobservable or unmeasured characteristics (like motivation and confidence), which in turn determine the program outcome. Obviously, randomization must take place before the program begins.

### **2.6.2. Quasi-Experimental (non-randomized) Method**

Quasi-experimental method consists of constructed (matched) control where individuals to whom the intervention is applied are matched with an “equivalent” group from whom the intervention is withheld (Ezemenariet *al.*, 1999).

According to Jalan and Ravallion (2003), a quasi-experimental method is the only alternative when neither a baseline survey nor randomizations are feasible options. The main benefit of quasi-experimental designs is that they can draw on existing data sources and are thus often quicker and cheaper to implement, and they can be performed after a project has been



implemented. The most frequently used quasi-experimental design methods available for evaluating development programs include propensity score matching (PSM), difference in differences (DD), regression discontinuity design (RDD), and instrumental variables (IV) (ADB,2006).

**Propensity Score Matching:** It is one of quasi-experimental method to estimate causal treatment effects. The method is tries to create the observational analogue of an experiment in which everyone has the same probability of participation. The difference is that in PSM it is the conditional probability  $P(X)$  that is intended to be uniform between participants and matched comparators, while randomization assures that the participant and comparison groups are identical in terms of the distribution of all characteristics whether observed or not. Hence there are always concerns about remaining selection bias in PSM estimates (Ravallion, 2005). The PSM is the best method to impact evaluators with time constraint and working in the absence of baseline data in that it can be applied with a single cross-section data.

**Difference-In-Differences:** Method in which one compares a treatment and comparison group outcome before and after a project for a sample of participants and non-participants. Program only around the cut-off point for eligibility and nothing can be said of individuals far away from it (Caliendo and Kopeining, 2005).

**Instrumental variables or statistical control:** In this method, one uses one or more variables that affect participation but not outcomes given participation. It is used to identify the exogenous variation in impact only due to the program, recognizing that the program is purposively placed rather than randomized. The instrumental variables are used to predict program participation first and then analyze how the outcome indicator varies with the predicted values (Baker, 1999).

## **2.7. Empirical Review**

### **2.7.1. Factors affecting participation in productive safety net program**

There are various factors that influence participation in productive safety net program. Some factors have been found theoretically to influence households' participation in safety net program. Such factors can be classified into demographic factors; socioeconomic factors and

institutional factors. The following section presents an empirical review of those variables that are related to participation in safety net program.

A study conducted by Okoyo and Shumye (2014) analyzed the determinants of participation in productive safety net program in Dire Dawa Administration, Ethiopia, using binary logistic model. The results showed that the probability of participating in the PSNP is positively and significantly affected by age of the household, household family size and credit service; Furthermore, size of irrigation land negatively and significantly affected participation on program. Similarly, Aman (2013) showed; distance from market, cultivated land, tropical livestock unit, oxen, access to irrigation, extension contact and access to credit were significantly influenced the participation in the program.

Temesgen (2014) in his study on determinants of participation in productive safety net program in Alaba special Woreda, SNNPR, using logit model revealed significant positive relationship between PSNP participation and dependency ratio, land holding, credit use, shock experienced; on the other hand, education, non-farm income and extension visit negatively and significantly influenced the program participation.

Mulugeta (2014) in assessing factors affecting participation in PSNP employed the logit regression model. The result of the logit model showed that fertilizer use, improved seed use and credit use significantly influenced participation in the program negatively and household size and sex of household head significantly influenced the program participation positively. The other study by Bazezew (2012) determining food security indicators at household level in drought prone areas of the Amhara Region, Ethiopia, using binary logistic model revealed non farm income, total production, total livestock, kilo calorie intake, per capital income and geographical location as the main factors determining household participation in the PSNP.

Additionally, Gebresilassie (2013) on his study on determinants of participation in productive safety net program via binary logistic regression identified age, dependency ratio, irrigable land, livestock holding, credit access, family size, education level, fertilizer use, saving experience and petty trading as the main significant factors in PSNP participation.

In summary, the above scholars' showed different factors which influenced households' food security and asset conditions affect households' participation in the program. Households with lower asset and food insecure were legible to be targeted by the program and also after participation in the program, the major criterion for households' graduation from the program were also food security and asset accumulation condition.

### **2.7.2. Impact of productive safety net program on household's food security**

The study of Mulugeta (2014) on impact of productive safety net program (PSNP) in DireDawa Administration by using propensity score matching (PSM) model showed statistically significant effect of the program on household food security. After controlling for differences in demographic, institutional and asset endowment characteristics of the PSNP and non-PSNP households, it has been found that, on average, the program has increased physical food consumption of the participating households by 158 calories. Stated in other words, the program has increased calorie intake of the participating households nearly 7% more than what they would have consumed in the absence of the program. Similarly, Gilligan *et al.* (2009) finding showed that the impact of program on mean caloric availability is higher by nearly 10 percent in PW-PSNP and other food security program (OFSP) beneficiary households compared to the non-beneficiary group.

Berhane *et al.* (2014) conducted a study on analysis of Impact Evaluation of Ethiopia's Productive Safety Nets Program. Findings showed that participation in the public works component of the PSNP has modest effects. It improves food security by 0.40 months and increases growth in livestock holdings by 0.28 Tropical Livestock Units (TLU). It improved the resilience of households as measured by their ability to raise funds in an emergency. Relative to non-beneficiaries, beneficiary households perceive that their welfare has improved. However, it also leads to an increase of 4.4 percentage points in the likelihood that a household is forced to make a distress asset sale.

Yebeltal (2008) applied the PSM model to assess the impact of Integrated Food Security Program on household food poverty in Bant-Belessa districts of Amahara region. The study found that the program has increased participating households' calorie intake by 30% (i.e., 698 calories) compared to that of non-participating households.

Temesgen (2014) assessed the impact of PSNP in Alaba special woreda in SNNPR by using PSM model and the result showed that the program has brought significant effect on food security. After controlling for pre-intervention differences in the characteristics of the PSNP and non-PSNP households, it has been found that, on average, the program has increased physical food consumption of the participating households by 365.3 Kcal/AE/day. That means, the program has increased calorie intake of the participating households by more than 18% what they would have consumed in the absence of the program. This shows that households in the program are slightly better off in calorie intake than non-participant.

Similarly, Aman (2013) studied the impact of PSNP in ZuwayDugdaOromia Region by using PSM model and the result confirmed that the program brought significant effect on food security. After controlling for pre-intervention differences in demographic and asset endowment characteristics of the beneficiary and non-beneficiary households, it has been found that, on average, the non-beneficiaries' food consumption has a bit increased. But the mean difference between beneficiary and non-beneficiary households' calorie intake is not statistically significant after matching. It is possible to say that even non-beneficiaries had better consumption, even though beneficiaries fulfilled their basic needs. This narrow gap between the two groups indicates the improvement of participant household livelihood and this improvement was an impact of the program. It covers the six-month food gap and encourages them to produce more through giving credit and other facilities.

However, the other study by Fikadu (2014) on impact of productive safety net program on food security in Ethiopian Somaliregion: the case of keberibeyahworeda by using the same model showed that the program has not improved the food consumption status of participant household. Because of the Woreda is highly exposed to drought as a result of scarcity of rainfall, large sizes of livestock are dying each year. Nevertheless, the quantity of food aids (the transfer) provided monthly for beneficiaries is not as such enough in order to feed whole household members month up to month.

### **2.7.3. Impact of productive safety net program on household's asset building**

The program implementation manual, another objective of PSNP is to protect asset of the program beneficiaries from depleting. The idea is when households become food insecure

they are forced to sale their asset and fill their food expenditure. This circumstance eventually would worse the poverty situation of these poor households. Thus, it is to protect the assets from depleting that the program offers food and cash transfer.

The study of Fitsum (2013) on impact of productive safety net program in Eastern HarargheHaramaya by using propensity score matching model showed statistically significant effect of the program on household asset building. The model output showed that the asset at the hands of the PSNP beneficiary households is higher than the asset at the hand of the PSNP-non beneficiary households. The mean difference of asset between the PSNP beneficiary and non-beneficiary households is found to be positive and significant as beneficiary households' asset increased by 446 birr. Statistically, the ATT for the treated and control group is found to be significant at 1% level. Similarly, Mulugeta (2014) showed that the rate of change in value of livestock for the participant is better and also a significantly higher than that of the non-participant households at 1% level. Therefore, the impact of PSNP on livestock asset shows that it has a significant effect on program beneficiary.

A study conducted by Aman (2013) evaluated impact of productive safety net program on households' food security and asset building, in ZuwayDugda District Oromia Region. After controlling for pre-intervention differences, it has been found that, on average, the program beneficiaries have fewer assets than non-beneficiarise. However, the mean difference of asset between beneficiary and non-beneficiary households was statisticialy significant. On the other hand, PSNP has also brought positive impact on the food expenditure of the program beneficiary households with an increment in a 1.85 ETB (Ethiopian birr) that is more than 40% higher than the non- beneficiary households. The non- food expenditure per annual of the program beneficiary households was increased by 266.57 Birr which is about 28% higher than the non-beneficiaries. Additionaly, the program had a positive impact on the total annual income of participanting households by 5092.38 ETB which is higher by more than 47% than non-participants, but the program hasn't brought a siginificant change in the total asset value of the beneficiary households, probably because public work activities were run on publicly owned assets. Therefore, it would be difficult to see the level of asset building on household level. Also, the payment given to their participant may not be enough to cover up their daily

requirements. If the income from PW exceeds the consumption status of household; it could have been used to build asset (Temesagen, 2014).

The other study by, Mamo (2011) which assessed the impact of PSNP on asset accumulation and sustainable land management in Adami TuluJidoKombolcha and Meskan Districts by using the same model showed that participation on program had not brought a significant impact on the asset building. The insignificant impact can be attributed to the fact that the program transfer on asset of the program transfer was mainly for consumption smoothing purpose than asset building. Also, Gilligan *et al.* (2008) employed the PSM techniques to evaluate the impact of Ethiopia's PSNP and its linkages in the national level. The finding of the study showed that relative to the control group, participants did not experience faster asset growth even when the PSNP was complemented with OFSP.

Another study conducted by Andersson *et al.* (2011) evaluated the impact of the Ethiopian PSNP on rural households' livestock and eucalyptus trees holding in Amhara region of Ethiopia. This study found that program participation had a positive effect on number of trees planted, but the program hasn't brought a significant change in the livestock asset value of the beneficiary households.

## **2.8. Conceptual Frame Work of the Study**

PSNP is a public program through which food-insecure people are employed in public work during the agricultural slack season to smooth consumption so that they will not need to sell productive assets in order to overcome food shortages. The public work is also intended to create valuable public goods; moreover, by reducing seasonal liquidity constraints and it is intended to stimulate investments as well. Different factors were assumed to influence foodsecurity conditions affect households' participation in the program. These factors includes; demographic factors; age of household head, sex of the household head, dependency ratio, and household size, socio-economic factors; land holding, off/non-farm income, and livestock ownership, institutional factors; education level, extension service, credit use, distance to market, use of chemical fertilizer, and use of improved seed. Households with lower asset and food insecure were legible to be targeted by the program and after

participation in the program, the major criterion for households' graduation from the program were also food security and asset accumulation condition.

This study was conducted with the understanding that PSNP has assured food consumption and prevented asset depletion for food insecure households in the district, while stimulating markets, improving access to services and natural resources, and rehabilitating and enhancing the natural environment. By this contribution and support from the program participants showed expected outcome in food security and wealth of well accumulated asset.

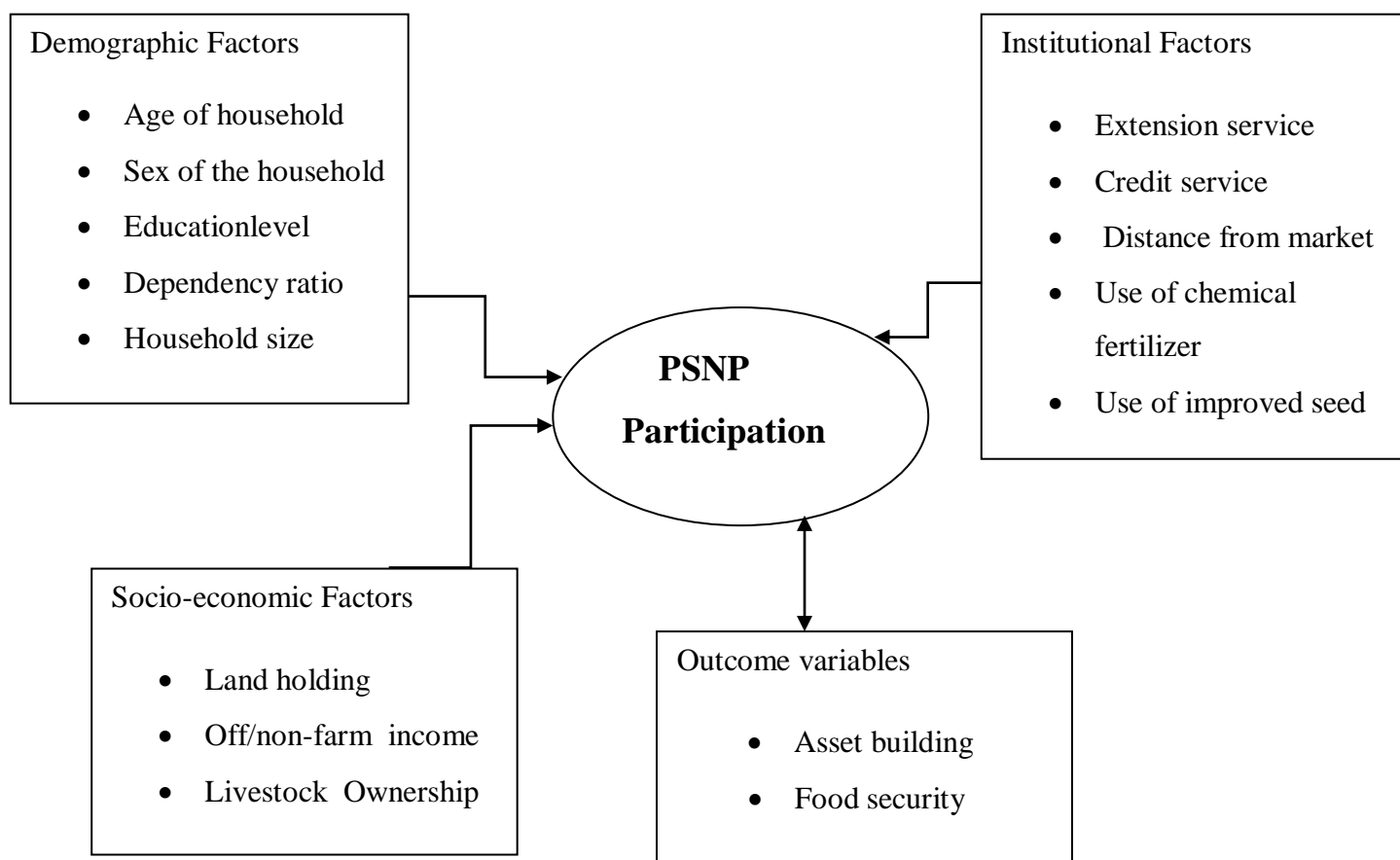


Figure 1: Conceptual Framework of the study

Source: Adapted from Okoyo (2014)

### **3. RESEARCH METHODOLOGY**

#### **3.1. The Study Population and Description of the Study Area:**

The study was conducted in Misha district of Hadiya Zone, Southern region, Ethiopia. It is located 248km away from Addis Ababa, capital city of Ethiopia and 212 km from the regional capital town, Hawassa. It is bounded by Gibe woreda in the West, Lemoworeda in the East, Gurage Zone in the North and Gomboraworeda in the South. The Woreda has both highland (45% of the area) and midland (55% of the area) altitude. It is situated at 1500-2950 meters above sea level and has an average temperature ranging from 21°C to 25°C. The annual rain fall is 2371 mm per year. More than 95% of the population was engaged in agriculture. The district has 32 rural kebeles and 3 urban towns with a total human population of 169,129 from total population eighty-two thousand one hundred thirteen (82,113) are males and the remaining eighty-seventhousandsixteen (87,016) are females (MWFEDO, 2017).

The Agro ecology of the woreda is highland which covers 49.7% from the total land; the remaining 50.3% is lowland. The agricultural system is mixed farming. Households grow enset; wheat; potatoes; barley; beans and peas. Maize is a very minor crop grown only to provide a small amount of green consumption in July and August. Since there are no pure cash crop in the woreda; all those crops are both consumed and sold. Enset is the main food crop and wheat is the main crop sold for cash. Those household that own oxen use them for plowing their fields; while those who do not mainly work for others in exchange for the use of their oxen. The soil is not particularly fertile and crop production depending on fertilizer usage for all crops, except enset.

Cattle, sheep and equines (donkey, horse & mules) are reared in this woreda; but the types of livestock owned vary considerably from one wealth group to the next. Due to lack of grazing land; households tend to keep small number of animals and use a zero-grazing system for feeding their livestock. Households obtain most of their cash income from crop sales, livestock and livestock product sales, and in the case of very poor and poor households, casual employment (MWA0, 2017).



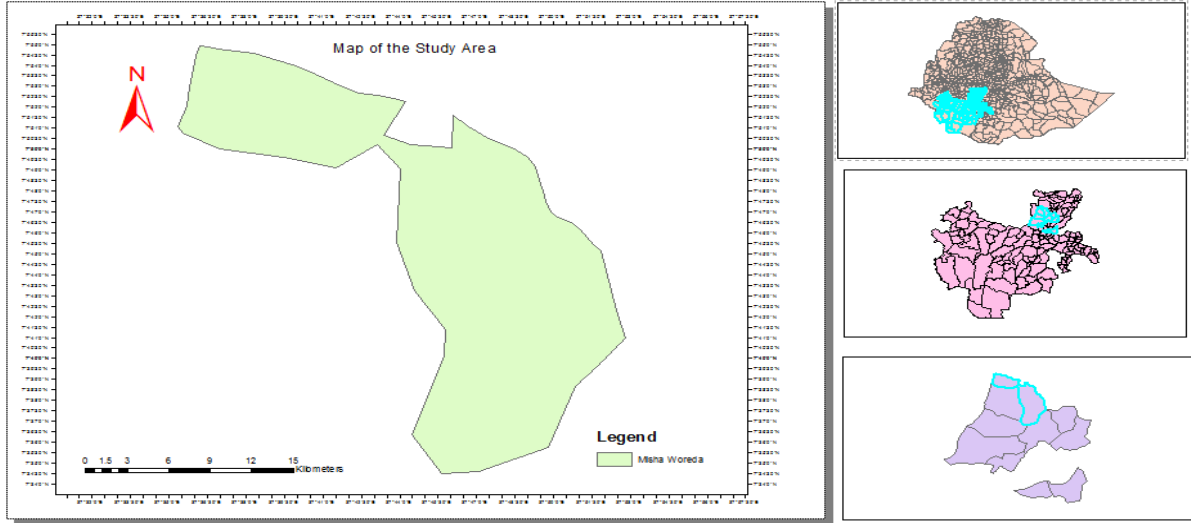


Figure 2: Map of the study area

### 3.2. Sample Size and Sampling Techniques

To select sample respondents, two-stage sampling technique was employed. In the first stage, simple random sampling technique was applied to select four kebeles out of the total thirty-two rural PSNP kebeles of the district.

Once the kebeles are identified, in the second stage, a stratified technique was employed to select beneficiary and non-beneficiary households using a sampling frame. The sampling frame was the list of households from kebele. In order to determine the household sample size, statistical formula developed by Yemane (1967) was applied. This formula takes into consideration the number of total population (total households head) and significance level. Accordingly, the formula is

$$n = \frac{N}{1+N(e)^2} \dots \dots \dots (1)$$

Where  $n$  is the sample size,  $N$  is total number of households (given that 33788), and  $e$  is level of precision assumed to be 8%. By using stratified sampling 155 households (83 participants and 72 non-participants) were selected from four sample kebeles. As the numbers of households in each kebele is different, sample size of each kebele was determined based on probability proportional to size (PPS), as follows:

$$n_i = \frac{nN_i}{N} \dots\dots\dots (2)$$

Where **n** is sample size, **N** is total number of households, **N<sub>i</sub>** is total number of households in **i<sup>th</sup>** kebele & **n<sub>i</sub>** number of sample size in **i<sup>th</sup>** kebele.

Table 1: Distribution of sample households by kebeles

Sample kebeles	Total Households	PSNP beneficiary households	Sample of PSNP beneficiary	PSNP non-beneficiary households	Sample of PSNP non-beneficiary	Total Sample
Dengawura	417	229	18	188	15	33
Morsito	570	325	26	245	20	46
Abushira	520	290	23	230	18	41
Ashwelwato	432	194	16	238	19	35
Total	1939	1,038	83	901	72	155

**Source:** Woreda FSO, (2018)

### 3.3. Data Types and Data Collection Methods

In this study, both quantitative and qualitative data were collected from primary and secondary source. The primary data were collected from the sampled respondents of both participant and non-participant on different characteristic such as demographic and socio-economic characteristics of households by using semi-structured questionnaire. That questionnaire was first prepared in English language, and then it translated in local language to facilitate the interview process. Focus group discussions were held at group meeting to strengthen and supplement the data obtained from survey questionnaire. In addition key informants' interview was also used as additional source of data. Furthermore, different secondary data were used for this study from reports, books, journals, articles, working papers, and Woreda agriculture office.

### 3.4. Food Security Measurement

Household dietary diversity score (HDDS) was used for measuring food security status of household through measuring micronutrient intake. HDDS used as part of any food security and nutrition information system, at the regional or national level. They can help in early

warning systems and in targeting of interventions. They are also used at the community level for the evaluation of programmes aiming at improving population's food security and nutrition. Open recall method was used to collect data. One day or 24-hour dietary recalls were conducted at the respondents' homestead during each survey. During the 24-hour dietary recalls conducted at the household level, the respondents were asked to describe all types of foods if they or any members of their households had eaten or drunk in the previous 24 hours. Only foods consumed by household members at home and not those purchased and consumed outside the home were recorded. The data for the HDDS indicator is collected by asking the respondent a series of yes or no questions. These questions should be asked of the person who is responsible for food preparation, or if that person is unavailable, of another adult who was present and ate in the household the previous day. The questions refer to the household as a whole, not any single member of the household. The household dietary diversity score (HDDS) was computed based on twelve food groups recommended by FAO and it ranges from 0 to 12, with a sum of 12 scores (FAO, 2011).

### **3.5. Household Asset Measurement**

The asset list covered livestockholding (Oxen, Cows, Heifers, Calves, Sheep, Goats, Donkeys, Horse, Mule and Poultry), productive assets (Plough, Sickle, Pick axe, Axe, Hoe, Spade and others) and Consumer durable goods (Television, Mobile telephone, Radio, Bed, Mattress, Chairs, Tables and House). For effortlessness of presentation we report here the change in value of assets by PSNP status, together with the main reasons cited for the change in assets over the last four years' period. In order to create a total asset value per household it was necessary to impute prices to assets. To do this we computed the mean price per asset, using the reported prices within the data set. Using PSM, we tried to reveal that whether PSNP transfer has enabled some accumulation of assets for beneficiary households or not.

### **3.6. Methods of Data Analysis**

The data were analyzed using both descriptive statistics and econometric model. Descriptive statistics used to describe the socio-economic and demographic characteristics of the treatment and controls. Propensity score matching (PSM) was used in this study since it is a commonly used non-parametric approach and the method helps to control with and without

difference on the covariates in order to minimize the selection bias of the sample participant and non-participants.

### **3.6.1. Descriptive statistics**

Descriptive statistics which include mean, median, standard deviation, percentages, graphs and tables was used in the process of describing different demographic and socio-economic status of the sample households. In addition, t-test and chi-square test were used to test whether there are significant mean and percentage difference between two groups of households in terms of continuous and categorical explanatory variables.

### **3.6.2. Propensity Score Matching Method**

Propensity score matching model was used to address the two objectives (to assess the impact of PSNP on HH food security and to assess (measure) the impact of PSNP on HH asset building). Participation in PSNP is none randomized and lacks baseline survey. That is, households who are eligible to the selection are purposively selected based on their asset holding and exposure to shocks and problem of food security.

For both case Stata version 13 Software by compactable Psmatch2 employed for the analysis of the data. The methodological difficulty in the estimate effect obtained by comparing a treated group with non-treated groups could be biased because self-selection and systematic judgment problem (Dehejia, R.H. and Wahba, S., 2002).

When the relevant difference between two units of treated and untreated group are captured in the observable covariates which occurs when outcome is independent of assignment to treat, then the matching yield an unbiased estimate of treatment impact. Impact of productive safety net program are multi-dimensional on their clients, that observable in different forms like assure food consumption, prevent asset depletion, stimulating markets, improving access to services and natural resources, and rehabilitating and enhancing the natural environment.

There are also spill-over effects multi-dimensional safety net program extends to participant and society at large as indirect benefits. Those cause measuring and impact evaluation difficult of productive safety net program intervention (Okoyo and Shumuye, 2014).

The correct solution for this puzzle is propensity score matching, because it diminishes dimension of covariate by matching respondents with covariates for treated and untreated groups. Becker and Ichino (2002) argue that deploying propensity score matching reduce the high dimensionality challenge of observables characteristics in impact evaluation to specific direction since it reduces dimension of covariate and can balance observables between treated and untreated. Not only PSM reduce the dimensionality of observables characteristics of treated and untreated groups but also it reduces bias. According to Dehejia *et al.* (2002), applying propensity score matching reduce bias.

Similarly, Rubin (1983) define propensity score as conditional probability of treatment given pretreatment characteristics suggest that PSM as a method to reduce bias in the estimation of treatment effects with observational data set. Therefore, based on the idea that the bias is reduced when the comparison is performed using treatment and control who are as similar as possible.

This study applied the propensity score matching method to match each PSNP participation with control clients who had the same probability of joining PSNP participant. A group of control client was selected in this way which can then serve as an accurate control group to correct for selection bias. The method has been applied by previous studies (Temesgen, 2014: Aman, 2013: Mulugeta, 2014, Mamo, 2011 and Hassen, 2012) to assess the impact of safety net program in various parts of the country.

Propensity score is a conditional probability estimator, and any discrete model such as logit or probit can be used as they yield similar results (Caliendo and Kopeinig, 2008). This study employed logit model assuming logistic distribution of the sample mean and variances. The matching estimators are nearest neighbor, radius, and caliper, stratified, and kernel matching method all conditional on propensity score. The propensity score model is expressed as: -

$P(x) = \Pr \{D = 1 / X i\} = E \{D / X i\}$  is the probability of participating in the program conditional on X. If outcomes without the intervention are independent of participation given X, then they are also independent of participation given  $P(X)$  which reduces Where  $D = \{0, 1\}$  is the dummy variable representing whether a household are participant on safety net

program (1) or not (0) and X is the multidimensional vector of treatment characteristics relatively stable household characteristics in own context.

A logit model was applied to estimate propensity scores using a composite of predictors' characteristics of the sampled households (Rosenbaum and Robin, 1983) and matching were then performed using propensity scores of each observation. In estimating the logit model, the dependent variable was participation in PSNP, which takes the value of 1 if a household participates in the program and 0 otherwise. The mathematical formulation of logit model following Gujarati (2004), the functional form of logit model is specified as follows:

$$P(x) = \frac{e^{zi}}{1+e^{zi}} \dots\dots\dots (1)$$

Where P(x) is probability of participation

$$Zi = \beta_0 + \sum_i^n \beta_i X_i + \mu_i \dots\dots\dots (2)$$

Where, i=1, 2, 3- - - - - n

$\beta_0$ =intercept

$X_i$ = explanatory variables (covariates)

$\beta_i$ = regression coefficients to be estimated

$\mu_i$ = a disturbance term, and the probability that a household belongs to non-program group is;

$$1-P(X) = \frac{1}{1+e^{zi}} \dots\dots\dots (3)$$

Then the odds ratio can be written as:

$$\frac{P(X)}{1-P(X)} = \frac{1+e^{-zi}}{1+e^{zi}} \dots\dots\dots (4)$$

The left side of equation (4)  $\frac{p(x)}{1-p(x)}$  is simply the odds ratio in favor of participating in PSNP. It is a ratio of the probability that the household would participant in the PSNP to the probability that he/she would not participate in the PSNP. Finally, by taking natural log of equation (4) the log of odd ratio can be written as:

$$Li = \text{Ln} \left( \frac{p(x)}{1-p(x)} \right) = \text{Ln} (e^{\alpha_0 + \beta_i \sum_i^n 1x_i + \mu_i} = z_i = \alpha_0 + \beta_i \sum_i^n 1x_i + \mu_i \dots\dots\dots (5)$$

Here the main question is how far household get improvement on food and asset favor in terms of livelihood indicators as a result of participating in productive safety net program relative to household that not participating in this case investigator use average effect of

treatment on treated (ATT). Therefore, impact of safety net program based on PSM is defined as follows by: -

$$ATT = E(y_{i1} - y_{i0})$$

$$ATT = E(Y_{1i} - Y_{0i} | D=1) = E(Y_{1i} | D=1) - E(Y_{0i} | D=1) \text{ ----- (6)}$$

When (D=1) we observe Y1; when (D=0) we observe Y0. Researcher goal is to identify the average effect of treatment on participant and non-participant households. It is defined as:- The evaluation problem is that we can only observe (Y1i/D=1) however (Y0i/D=1); does not exist in the data, since it is not observed.

E (Y1i/D=1) is expected outcomes for those who participate in safety net program insystem; E (Y0i/D=1) is the counterfactual outcome that would have occurred in the absence of participation.

For estimation ATT result using the E [Y0/D = 0] mean outcome of untreated respondents can cause to a self-selection bias reason is indicated above, outcome of individuals from treated and untreated group not the same even in the absence of treatment of safety net program. It can be possible to note ATT as:

$$E [Y_{1i} | D = 1] - E [Y_{0i} | D = 0] = ATT + E [Y_{0i} | D = 1] - E [Y_{0i} | D = 0] \text{ ----- (7)}$$

$$E [Y_{0i} | D = 1] - E [Y_{0i} | D = 0] = 0 \text{ ----- (8)}$$

Then ATT defined unbiased situation equation stated the same to above equation (6);

$$ATT = E(Y_i - Y_o | D=1) = E(Y_i | D = 1) - E(Y_o | D=1)$$

Underneath two key conditions, PSM method applied to estimate ATT and to make it free from bias. The first is the conditional independence, in which we assume that there exists a set of observable characteristics (X), such that after controlling for these, the potential outcomes are independent of whether the individual is in the treatment group or in the control group hence the conditional independence assumption expressed as;

$$(Y_1, Y_0) \perp D | X \text{ ----- (9)}$$

Where:  $Y_1$  and  $Y_0$  are household outcomes if participates, and gets a service and household outcomes if it does not participates and not gets services from program, " $\perp$ " is referred to as independence, and  $X$  is a set of observable characteristics. The second is common support assumption, in which we assume that there is a positive, non- zero probability of being both treated and untreated, for each value of:-

$$0 < P(D = 1 | X) < 1 \text{ ----- (10)}$$

### 3.6.2.1. Choice of Algorithm

Matching estimators: After the estimation of propensity score, in PSM is choosing among different matching estimators. In theory, several matching estimators of PSM are available. However, only the most commonly applied estimators are compared to select one that best fit for own data.

**Nearest neighbor matching (NNM):-** Is the most straightforward matching estimator. This match treated household with untreated household individual in closest in terms of covariate (Caliendo and Kopeinig, 2008). NNM in this study employ since the study take investigation on non-experimental. Therefore, the nearest neighbor matching help to estimate treatment effect on treated with untreated rural area households by comparing one group with closest propensity score.

**Caliper matching (CM):-** The above discussion tells that NN matching faces the risk of bad matches, if the closest neighbor is far away. To overcome these problem researchers, use the second alternative matching algorithm called caliper matching. Caliper matching means that an individual from the comparison group is chosen as a matching partner for a treated individual that lies within a given caliper (propensity score range) and is closest in terms of propensity score (Caliendo and Kopeinig, 2005). If the dimension of the neighborhood is set to be very small, it is possible that some treated units are not matched because the neighborhood does not contain a control unit. On the other hand, the smaller the size of the neighborhood the better is the quality of the matches (Becker and Ichino, 2002). One problem in caliper matching is that it is difficult to know a prior what choice for the tolerance level is reasonable.



**Kernel matching (KM):-** Is to match treated group with untreated by using weighted average covariates of all individuals untreated group in order to construct counterfactual (Caliendo and Kopeinig, 2005). This method uses more information and hence advantageous in lowering variance rather than others. However, it has own drawback of probability of using bad match from observations this in turn impose the common support. Region of common support: - Employing of common support is the third important step in PSM because average treatment effect on treated and on untreated group defined in the common support region for evaluation of program (Caliendo and Kopeinig, 2005).

In this study, the Nearest Neighbor matching, Caliper matching and Kernel matching were tested one by one to choose the best estimator for evaluation as well as to avoid bad matches. Based on the result of test, Kernel matching estimator with bandwidth (0.5) was selected as best estimator, than the other two matching estimators.

### **3.6.2.2. Common support**

Imposing a common support condition ensures that any combination of characteristics observed in the treatment group can also be observed among the control group (Becker and Ichino, 2002). The common support is the region where the balancing score has positive density for both treatment and control units. No matches can be formed to estimate the ATT parameter when there is no overlap between the treatment and control groups. We define the region of common support by dropping observations below the maximum of the minimums and above the minimum of the maximums of the balancing score (Caliendo and Kopeinig, 2008).

### **3.6.2.3. Testing the Matching Quality**

One important concern that should be taken care of while doing PSM is balancing test. Testing matching quality also important step in PSM is checking for matching quality whether the matching procedure is able to balance the distribution of the relevant variables in both the control and treatment group (Caliendo and Kopeinig, 2008). In this study four matching quality indicators are employed those, standardized bias, T-test, joint significance and Pseudo-R<sup>2</sup>. The main purpose of the propensity score matching is not to perfectly predict

selection into treatment but to balance all covariates while, differences in covariates are before matching, these should be avoided after matching.

#### **3.6.2.4. Sensitivity analysis**

The other important step in the implementation of PSM in own case is check sensitivity of the estimated ATT results. Recently checking the sensitivity of the estimated results becomes an increasingly important topic in the applied evaluation literatures (Caliendo and Kopeining, 2008). Matching method is based on the conditional independence or unconfoundedness assumption, which states that the evaluator should observe all variables simultaneously influencing the participation and outcome variables. This assumption is basically non-testable because the data are uninformative about the distribution of the untreated outcome for treated units and vice versa (Baker and Caliendo, 2000).

As outlined in equation (9) the estimation of treatment effects with matching estimators is based on the unconfoundedness or selection on observables assumption. However, if there are unobserved variables which affect assignment into treatment and the outcome variable simultaneously, hidden biases might arise (Rosenbaum, 2002). In other words, if treatment and outcomes are also influenced by unobservable characteristics, then CIA fails and the estimation of ATTs is biased. The size of the bias depends on the strength of the correlation between the unobservable factors, on the one hand, and treatment and outcomes, on the other.

It must be obvious that matching estimators are not robust against these hidden biases. Different researchers have become more and more aware that it is important to test the robustness of results to departures from the identifying assumption. Because it is not possible to estimate the magnitude of selection bias with non-experimental data, the problem can be addressed by sensitivity analysis.

Rosenbaum (2002) proposes using Rosenbaum bounding approach in order to check the sensitivity of the estimated ATT with respect to divergence from the CIA. The basic question to be answered here is whether inference about treatment effects may be altered by unobserved factors. In other words, one wants to determine how strongly an unmeasured

variable must influence the selection process in order to undermine the implications of matching analysis.

Ultimately, using predicted probabilities of participation in the program that propensity score match pairs are constructed using alternative methods of matching estimators. Then the impact estimation is the difference between simple mean of outcome variable of attention for participant and non- participant households. The difference in the contribution of safety net program between treatment and control households. The ATT is obtained by averaging these differences in productive safety net program outcomes ( $Y_i$ ) across the  $k$  matched pairs of households as follows:  $ATT = \sum_{i=1}^k [y_i = D = 1 - y_i = D = 0]$

A positive or negative value of ATT suggests that households who have participated in safety net program intervention have higher or lower outcome variable  $Y_i$  than non-participants.

### **3.7. Definition of Variables and Hypothesis**

#### **3.7.1. Dependent variable**

The dependent variable in this study is participation in productive safety net program: It is a dummy variable that takes a value 1 if a household participates in PSNP and 0 otherwise.

#### **3.7.2. Outcomes Variables**

**Food security (FS):** The household food security, which is, the outcome variable. It is a continuous variable measured by using previous 24-hour household dietary diversity score.

**Household asset (HA):** The household asset is the main indicator of the program impact, which shows what extent to which the household asset level changes in birr. Household assets which are measured in birr such as livestock holding, farm tools and household durable goods owned by the household:

#### **3.7.3. Independent variables**

According to several authors, theories and researcher experience different factors that affect the participation of household in productive safety net program are included in the model. These are: -

**Age of household head:** Age is a continuous explanatory variable peculiar to the household head. As age of household increases, it is assumed that farmers could acquire more knowledge and experience. Age, as a proxy, indicates that and pre-assumes vulnerability and risk conditions of food insecurity is low among aged households. They are more risk averter and the chance of a household to become more food secure increases along an increase in age (Mequanent, 2009; Aman, 2013). Hence, the likelihood of being program participant would decrease with the age increase.

**Sex:** It is a dummy variable that takes value 1 if the household head is female and 0 if the household is male. Male-headed households are in a better position to pull more labor force than the female-headed ones; female headed household are forced to rent their land. Because of female may not go far away from their home for labor or petty trading because of their home responsibilities, cultural norms and other factors related sexual exploitation. Sex of the household head is an important determinant of food insecurity (Mulugeta, 2014; Aman, 2013). Therefore, this study hypothesizes that female-headed households will have a positive relation with participation in PSNP.

**Household size:** It is a continuous variable measured in number. It refersthe total number of household members who live and consume from the same household. Some studies showed that a large household size is negatively associated with food security (Mamo, 2011; OkoyoandShumiye, 2014; Aman, 2013; Mulugeta, 2014). The studiesshowedthat relatively large number of family members negatively affected households' food security status. Hence it is hypothesized that households with large family size aremore likely to be participant on the program.

**Educational level:** It is a continuous variable. Temesgen (2014) found that an increase in educational level of the household head by year decreases the probability of participating in PSNP. Similarly, Mulugeta (2014) showed that education is a very important determining factor in food security as educated farmer is able to use modern agricultural technologies, perform farming activities based on cropping calendar, and manage resources properly. All these factors increase production, which improves availability and accessibility of enough food. Thus, this study hypothesized that education has negative relation with program participation.

**Land size:** Is a continuous variable measured in hectares of the total land owned by the household. Total land owned by the household is taken as proxy for farm size and is an indicator of wealth and income and is expected to be associated with food security. As the land size increases, provided that other production factor remains normal, the likelihood that the holder gets more output also increases. Farm size, and land quality are significant determinants of household food security (Felekeet *al.*, 2005). Because of this, it is hypothesized that farmers who have larger farm land are more likely to be food secure than those with smaller land area and has negative relationship with participation in the safety net program.

**Off/non-farm income:** It is a continuous variable measured in amount of birr that was obtained from off/non-farm activities. Participation in off/non-farm income generating activities is an important aspect to increase household income. Temesgen (2014) and Mulugeta (2014) showed that off/non-farm income affects the probability of participation in the PSNP negatively and significantly. This is justified by the fact that the absence of liquidity problem solves the problem of food security and the need of support thereby decreasing the participation in the program. Similarly, according to Okoyo and Shumuye (2014) agricultural production may not be the only source of rural household's income, or even their most important source of income. This study therefore hypothesized that off/non-farm income has negative relation with program.

**Frequency of extension contact:** It is continuous variable measured in the number of contacts with the development agents. Some studies reported that the number of extension service have negative influence on participation in PSNP. Farm households who use advisory services provided by development practitioners are more likely to adopt better technologies and improve production. Hence, household's use of extension service is expected to have positive effect on food security and hence negatively related with probability of participation in a safety net program (Temesgen, 2014; Aman, 2013 and Mulugeta 2014). Therefore, this study hypothesized that extension service has negative relation with program participation

**Livestock ownership:** It is a continuous variable measured in Tropical Livestock Unit (TLU). It refers to the total number of livestock owned by the farm household. Households' who had large livestock size were expected to be less vulnerable to food security.

Theoretically, livestock can support households in two ways. First, livestock is used as a source of cash to purchase inputs such as fertilizer. Second, they provide farmyard manure and compost for fertilizer. In this regard, livestock ownership has positive impact on fertilizer use and manure application (Croppenstedt *et al.*, 2003; Adenew and Pender, 2004; Tizale, 2007; Mamo, 2011). Livestock production constitutes a very important component of agricultural economy, a contribution that goes away from direct food production to include multipurpose use such as skins, fiber, manure and income from sales of livestock and livestock products, which are often used for purchase of food grains during times of food shortage (Aman, 2013; Okoyo and Shumuye, 2014). Thus, this study hypothesized that livestock ownership has negative relation on program participation as it contributes for food security via its income and input provision effect.

**Use of chemical fertilizer:** It is a dummy variable taking value 1, if the farmers used fertilizer; 0, otherwise. Fertilizer use has often been supposed as improving yield per unit area. Fertilizer use improves productivity per unit of cultivated land. Households using fertilizer are expected to have better food production ability than the non-users (Mulugeta, 2014). In this study households using fertilizer are expected to have better food security than non-users. Therefore, it is hypothesized negatively to be related with participation in PSNP.

**Use of improved seeds:** Is a dummy variable. It is an important source to increase production of crops. For this reason, it is expected that the use of improved seed is important to increase the household food security. They can increase agricultural productivity by encouraging overall production, which in turn contributes to attaining food security at the household level (Mulugeta, 2014). Hence; it is hypothesized to have negative relationship with participation of the program.

**Credit utilized:** It is a continuous variable measured by amount of birr. Credit is an important source of investment for expansion of agricultural production and food security. Those households who get credit have better possibilities to invest. They could purchase agricultural inputs and livestock. Households who were willing to participate in credit scheme became able to improving their income positions by performing different activities (Tesfaye *et al.*, 2008; Shimelis, 2009). Therefore, it is hypothesized that credit and PSNP participation are negatively correlated.

**Dependency ratio:** This refers to the ratio of number of HH member's that is considered not engaged in farm production system (age less than 15 and above 65) to total household size. The higher dependency ratio the more HH cannot protect and create assets (Hayalu, 2014). When a large household size corresponds with the availability of adequate adult labor, it can have a positive effect. But a household with more inactive productive labor force compared to the active age shows a high dependency ratio and it is more likely to be food insecure (Mulugeta, 2014 and Bigsten *et al.*, 2003). Therefore, this study hypothesized that dependency ratio affects positively the dependent variable.

**Distance from nearest market:** It is a continuous variable measured in kilometers from home of the household to the nearest market center. The closeness to market center will give the household alternatives on how to earn money and food (Temesgen, 2014). Proximity to market centers creates access to additional income by providing off/non-farm employment opportunities, easy access to inputs and transportation. Households near to market center have better chance to improve food security status and asset than those who do not have a proximity to market centers. This in turn implies the likelihood of participating in the program was less as compared to the counterparts (Aman, 2013). As a result, this study hypothesized that it is a negative correlation with dependent variable.

Table 2: Description, measurement and a prior expectation of the variables used in the logit model and PSM analysis

Variables	Descriptions	Type of variable	Expected sign
<b>Dependent variable</b>			
Participation	Participation in PSNP	Dummy	
<b>Outcome variables</b>			
Food security status	Dietary intake in HDDS	Continuous	
Household asset	Asset level in Birr	Continuous	
<b>Independent variables</b>			
Age	Age of the household head in years	Continuous	-
HH sex	Sex of the household head	Dummy	+
HHsize	Household size in number	Continuous	+
Education	Education level of household in years	Continuous	-
Land size	Land size of household in hectares	Continuous	-
Off/nf income	Off/non-farm income of household in birr	Continuous	-
Extension contact	Extension contact of household in number	Continuous	-
Livestock	Livestock ownership in TLU	Continuous	-
Fertilizer	Use of chemical fertilizer	Dummy	-
Improved seeds	Use of improved seeds	Dummy	-
Credit utilized	Credit utilization of household in birr	Continuous	-
Dndy ratio	Dependency ratio of HH in number	Continuous	+
Dst from nrstmrk	Distance from nearest market in km	Continuous	-

Source: own definition, (2018)

### 3.8. Multicollinearity Diagnosis

To study factors affecting household's participation in productive safety net program, data gathered from 155 household were subjected to logit regression analysis. Statistical packages SPSS-version 20 for Variance Inflation Factor and STATA Version 13 for contingency coefficient were employed to compute these values. Prior to running the logit model, both the continuous and dummy explanatory variables were checked for the existence of multicollinearity problem. The problem arises when at least one of the independent variables is a linear combination of the others. The existence of multi-collinearity might cause the estimated regression coefficients to have the wrong signs and smaller t-ratios that might lead to wrong conclusions.



There are two measures that are often suggested to test the presence of multi-collinearity. These are: Variance Inflation Factor (VIF) for association among the continuous explanatory variables and contingency coefficients for dummy variables (Gujarati, 2003).

The technique of variance inflation factor (VIF) was employed to detect the problem of multi-collinearity among the continuous variables. According to Gujarati (2003), VIF can be defined as:  $VIF(x_i) = \frac{1}{1-R^2}$

Where  $R^2$  is the squared multiple correlation coefficient between  $X_i$  and other explanatory variables. When the value of VIF is greater than 10, it indicates the existence of multicollinearity.

As such the hypothesis of presence of multicollinearity among the continuous variables was rejected. The VIF values displayed below (Appendix Table 2) have shown that all the continuous explanatory variables have no serious multi-collinearity problem.

Similarly, contingency coefficients were computed to check the existence of multi-collinearity problem among the dummy explanatory variables. The contingency coefficient is computed as:

$$C = \sqrt{\frac{\chi^2}{N + \chi^2}}$$

Where, C = Coefficient of Contingency

$\chi^2$  = Chi-square random variable and

N = total sample size.

For dummy variables, if the value of contingency coefficient is greater than 0.75, it is an indication of existence of the multicollinearity problem among those dummy explanatory variables. Based on this test there was no serious problem of multicollinearity to all dummy explanatory variables.

## 4. RESULTS AND DISCUSSION

### 4.1. Characteristics of Sample Households

This chapter presents the results of the descriptive and econometric analyses. The descriptive analysis made use of tools such as mean, percentage, and standard deviation. In addition, the Chi-square and t-test statistics were employed to compare households who have participated and who do not have participated in productive safety net program with respect to some explanatory variables. Subsequently, Propensity score matching (PSM) method was employed to estimate the impact of the program on household food security and asset building.

#### 4.1.1. Demographic, socioeconomic and institutional characteristics of households

**Age of the household head:** As indicated in Table 3, the average age of the sampled household heads was 48.19 years with a standard deviation of 11.64. The mean age of beneficiary households was 47.01 years with a standard deviation of 10.96, whereas, the average age was 49.54 years for the non-beneficiary households with a standard deviation of 12.31. The t-test shows that there is no significant statistical difference in age distribution between two groups.

**Household size:** The result in Table 3 shows that the average family size of sample households was 7.37 with a standard deviation of 2.32. The mean family size of beneficiary was 7.40 with a standard deviation of 2.55 and that of non-beneficiary was 7.35 with a standard deviation of 2.03. The t-test shows that there is no significant statistical difference in household size between two groups.

**Educational level:** The survey result shows that, the average educational level of the sample respondents was found to be 3.32 years with a standard deviation of 3.29. The mean educational level of the beneficiary households was 2.30 years with standard deviation of 2.37 and for the non-beneficiary households the mean was 4.48 years with a 3.79 standard deviation. The result of t-test for the difference in educational level between the two groups confirmed that there is a statistically significant mean difference in educational level between the two groups at 1% probability level.

**Dependency ratio:** The average dependency ratio of sample households was 0.57 with a standard deviation of 0.60. The mean dependency ratio of beneficiary households was found to be 0.77 with a standard deviation of 0.63, while that of the non-beneficiary households was 0.34 with standard deviation of 0.38. The result of the t-test for the differences in dependency ratio between the two groups was significant at 1% probability level ( $t = 5.0112$ ). This implies that every economically active person in the beneficiary households had to support less than one or 0.77 economically inactive person and every economically active person in non-beneficiary households had to support less than one or 0.34 economically inactive person.

**Land size:** The average agricultural land holding of the total sample respondents was found to be 0.9 hectares with a standard deviation 0.80 (Table 3). The average land size for the beneficiary households was 0.45 hectares with standard deviation of 0.27 and for the non-beneficiary households it was 1.39 hectares on average with a 0.89 standard deviation. The t-test result for the difference in agricultural land size between the two groups showed that there is a statistically significant mean difference between the two groups at 1% probability level.

**Frequency of extension contact:** The result also shows that the average number of extension contact by the DA's for who have participate in productive safety net program was 3.04 times per year having a standard deviation of 3.80, while who do not have participate in safety net program has an average number of extension contact to be 3.79 times per year with a standard deviation of 4.41. However, there was no significant difference in terms of extension contact among the groups.

**Credit utilized:** Sampled households have an average credit utilization of 1828.7 ETB with a 2556.9 standard deviation. To compare the credit utilization between the two groups the PSNP households have mean credit utilization of 1499.4 ETB with a standard deviation of 1935.0 and the mean credit utilization was 2208.3 ETB on average for the non-PSNP households with a standard deviation of 3095.7. The result of the t-test for the difference in the credit utilization between the beneficiary and non-beneficiary groups was found to be statistically significant at 10% probability level.

**Distance from nearest market:** Table 3 depicts the statistical results of the mean distance of sample households from the nearest market. Accordingly, the average distance of 6.5 Km

from the nearest market place having a standard deviation of 3.2. However, when comparing the distance of the nearest market place between the PSNP and non-PSNP households it was found that 7.1 Km and 5.8 Km on average for them respectively with standard deviation of 3.4 and 2.9 respectively. The result of the t-test for the difference in the distance from the nearest market place between the beneficiary and non-beneficiary groups was found to be statistically significant at 5% probability level.

**Off/non-farm income:** Results in Table 3 also show that the mean off/non-farm income of the sampled respondent households was 1282.2 ETB (Ethiopian Birr) per annual during the study period with a standard deviation of 2067.3 ETB. Furthermore, the average off/non-farm income for the PSNP households was 680.0 ETB having standard deviation of 962.2 and the off/non-farm income for the non-PSNP households was 1976.0 ETB having standard deviation of 2699.5. The statistical test result shows that the mean difference between the two groups has been statistically significant at 1% probability level.

**Livestock ownership:** Livestock provide milk, meat, income and transport. Moreover, they are sold as one of the coping mechanisms during foodshortage. The main Livestock owned by the sample households include cattle, sheep and goat, and poultry. The livestock ownership of the total sampled households was found to be 2.95 TLU on average with standard deviation of 1.27 (Table 3). The mean livestock ownership for the PSNP participant and PSNP-non participant households was 2.53 and 3.43 TLU respectively with 0.96 and 1.42 standard deviations. From the result of the t-test, it was found that there was statistically significant mean difference in livestock ownership between the two groups at 1% probability level.

Table3: Descriptive statistics of sample households (for continuous variables)

Variables	Total N=155		PSNP HHS N=83		Participant PSNP Non participant HHS N=72		t-value
	Mean	Std	Mean	Std	Mean	Std	
Age	48.190	11.640	47.01	10.960	49.540	12.310	1.353
Household size	7.370	2.320	7.40	2.550	7.350	2.030	0.135
Education level	3.320	3.290	2.30	2.370	4.480	3.790	4.366***
Dependency ratio	0.570	0.600	0.770	0.630	0.340	0.380	5.011***
Land size	0.900	0.800	0.450	0.270	1.390	0.890	9.120***
Frequency of extension contact	3.390	4.100	3.040	3.800	3.790	4.410	1.149
Credit utilized	1828.7	2556.9	1499.4	1935.0	2208.30	3095.70	1.733*
Distance from nearestmarket	6.50	3.20	7.10	3.40	5.80	2.90	2.622**
Off/non-farm income	1282.2	2067.3	680.0	962.2	1976.0	2699.5	4.088***
Livestock ownership	2.95	1.27	2.53	0.96	3.43	1.41311	4.692***

Source: Own calculation based on household responses

\*\*\*, \*\*and \* significant at 1%, 5% and 10% probability level respectively.

**Sex of the household head:** Out of the 155 respondents, 86.5 percent are male-headed and 13.5 percent are female-headed households (Table 4). With regard to the sex composition across groups 84.3% and 88.9% of the beneficiare and non beneficiare were male headed households. Similarly, 15.7% of the beneficiare and 11.1% of the non-beneficiare households were female headed. However, the statistical test analysis shows that there is no statistically significant difference in the sex of the household head between beneficiary and non-beneficiary households.

**Use of chemical fertilizer:** When comparing the use of fertilizer within the two groups, about 62.7 percent fertilizer users were from the beneficiaries where as 88.9 percent were from non-beneficiary households. The chi-square test shows that there was statistically significant difference between beneficiaries and non-beneficiaries' households at 1% probability level.

**Use of improved seed:** The result also shows that 61.4% of beneficiary respondents and 87.5 percent of non-beneficiaries used of improved seed. The statistical test shows that there was statistically significant difference between beneficiary and non-beneficiary households in using improved seed at 1% probability level (Table 4).

Table 4: Descriptive statistics of sample households (for dummy variables)

Variables	category	Participant (83)		non-participant (72)		Total (155)		$\chi^2$ -value
		Freq	Percent	Freq	Percent	Freq	Percent	
Household head Sex	Male	70	84.30	64	88.90	134	86.50	0.682
	Female	13	15.70	8	11.10	21	13.50	
Chemical fertilizer use	Yes	52	62.70	64	88.90	116	74.80	14.096***
	No	31	37.30	8	11.10	39	25.20	
Improved seed use	Yes	51	61.40	63	87.50	114	73.50	13.453***
	No	32	38.60	9	12.50	41	26.50	

Source: Own survey result (2018)

\*\*\*, significant at 1% probability level

#### 4.1.2. Sample household income, asset and dietary intake

Table 5 presents' descriptive statistics results of sample households based on their dietary intake, asset and income. To examine the level of total household annual income between the two groups, households were asked about agricultural products and by products primarily produced for sale, as well as farm and non-farm wage labor. Total income is therefore the sum of all agriculture and non-agriculture incomes. The mean income of the sampled respondents was 14207.0 birr perhousehold per year with standard deviation of 8196.6. Similarly, the mean income of beneficiary and non-beneficiaryhouseholds were birr 13005.25 and 15592.30 respectively with standard deviation of 5970.40 and 10045.10 respectively. The statistical test of the meandifference in incomes of beneficiary and non-beneficiary groups shows statisticalsignificant difference at 5%probability level.

Mean of asset holding of the sample households for the year 2017/18 was found to be 22979.50 ETB with standard deviation of 13678.36. The result shows that it was found to be 25195.96 ETB for the PSNP households with a standard deviation of 16906.94. For the non-PSNP households the mean total asset holding was 21056.79 ETB with a 9788.93 standard deviation. The statistical test result shows that the mean difference between the two groups has been statistically significant at 10% probability level.

The total dietary intake of the sample households in the previous 24-hour recall was found to be 5.13 DDS with standard deviation of 1.983. The result shows that it was found to be 5.43 DDS for the PSNP households with a standard deviation of 1.875, on the other hand for the non-PSNP households the mean total dietary intake was 4.78 DDS with a 2.057 standard deviation. The statistical test result shows that the mean difference between the two groups has been statistically significant at 5% probability level (Table 5).

Table 5: Descriptive statistics for household income, asset and dietary intake

Variables	Total households		PSNP Participant		Non-participant		t-value
	N=155		HHS (N=83)		HHS (N=72)		
	Mean	Std	mean	Std	Mean	Std	
Household income(birr)	14207	8196.6	13005	5971	15592	10045	1.978**
Household asset(birr)	22979.5	13678	25196	16907	21057	9789	1.895*
dietary intake(DDS)	5.13	1.983	5.43	1.875	4.78	2.057	2.076**

Source: Own calculation based on household responses

\*\*and \* significant at 5% and 10% probability level respectively

## 4.2. Results of the Econometric Model

This section describes the whole process to arrive at the impact of the program. It explains estimation of propensity scores, matching methods, common support region, balancing test and sensitivity analysis. It also explains the treatment effect of the program across the participating households.

#### **4.2.1. Factors affecting participation in productive safety net program**

The estimated parameters of the logit model on factors influencing participation in productive safety net program are presented in Table 6. The model estimation gave Pseudo-R<sup>2</sup> value is 0.608. A low R<sup>2</sup> value shows that the allocation of PSNP among the households has been fairly random (Pradhan and Rawlings, 2002). In other words, a low R<sup>2</sup> value means that program households do not have much distinct characteristics overall and as such finding a good match between program and non-program households becomes easier. The Pseudo-R<sup>2</sup> indicates how well the regressors explain the participation probability. After matching there should be no systematic differences in the distribution of covariates between both groups and therefore, the Pseudo-R<sup>2</sup> should be fairly low (Caliendo and Kopeinig, 2005).

Thirteen variables were hypothesized to explain factors affecting participation in productive safety net program. Out of these seven variables were found to be significant in explaining the factors influencing participation in PSNP. These are Age, Dependency ratio, educational level, land size, off/non-farm income, Livestock ownership, and Sex of household head.

As shown in table 6, age of households shows negative relationship with the participation of the PSNP, and it is significant at 10% levels of probability. The negative sign indicates that age negatively affects probability of participation in productive safety net program. This demonstrates that as age increases by one year, the probability of participation in productive safety net program decreases by 1.24%, keeping other variables constant. The reason for this finding is that comparing to older age of households, younger HHs had more chance to participate in the PSNP. This means that, as the age of the household head increases, there is a more probability that household could be food secure; since the older aged household is the more experienced he/she had in farming and weather forecasting. Besides older people have more access to land than younger people as young people have to wait for land redistribution or they have to share with families. This finding coincides with finding of Mequanent (2009) and Hiwot (2014) but contradicts with finding of Tadesse (2008).

Dependency ratio is positively associated with the probability of PSNP participation at 1% level of significance. The coefficient of number of dependents is positive and implies that number of dependents positively affects probability of household participation in the program



by a factor of 44.55%. This is mainly explained as the number of dependents increases, the likelihood of food insecurity increases for corresponding family, and thus increases the probability to participate in the program. This is because higher dependency ratio the more HH cannot protect and create assets and become more likely to be food insecure. This result is in consistent with that of Eneyew (2008); and Uraguchi (2012). Their finding shows that households with higher number of economically active family members less likely to participate in PSNP. The inverse relationship between higher number of EAFM and participation in the program might be because households who have higher number of EAFM are more likely to get additional off-farm income and hence being food secured.

It was also apparent from the results that the education level by years own for households is found to have negative and statistically significant at 1% significance level. The negative sign implies that education level negatively affects probability of participation in PSNP program. This implies that as education level increase by a unit, the probability of participation in productive safety net program decreases by 8.18%, keeping other variables constant. One of the reason is that educated people has additional way to earn income other than the PSNP and are not legible to participate in the program. This is consistent with the study of Temesgen (2014) findings shows that an increase in educational level of the household head by 1 year decreases the probability of participating in PSNP by a factor of 0.077 at 1% significance level negatively.

Land size was negatively related with program participation and it is significant at 1% significance level. The marginal effect of model out put showed that households who are addressed with a unit land size increase, the probability of participation in PSNP decrease by 92.86%, keeping other variables constant. This implies that households with more land size produce more and hence are less likely to be beneficiaries of PSNP due to food insecurity. This finding is consistent/ inline with Yibeltal (2008) who found land holding to be associated with program participation negatively and significantly.

Table 6: Logit estimation result for factors affecting HH participation in safety net program

Variables	Coefficients	Std. Err.	Marginal effect	p-value
-----------	--------------	-----------	-----------------	---------

Age	-0.053*	0.031	-0.0124	0.091
Household size	-0.004	0.154	-0.0009	0.980
Dependency ratio	1.887***	0.699	0.4455	0.007
Education level	-0.346***	0.122	-0.0818	0.004
Land size	-3.933***	1.045	-0.9286	0.000
DAfrequency	0.015	0.087	0.0036	0.862
Credit amount	0.001	0.002	2.81e-06	0.927
Market distance	-0.016	0.094	-0.0037	0.869
Off/non-farm income	-0.001**	0.003	-0.0002	0.016
Total livestock	-0.727**	0.343	-0.1715	0.034
Sex	3.106*	1.795	0.6119	0.084
Fertilizer use	-0.069	0.859	-0.0164	0.936
Improved seed use	-1.368	1.022	-0.3274	0.181
Constant	9.474	3.012		0.002
Number obs =155		LRchi2 (13) =131.29 = Logistic regression-R <sup>2</sup>		
PseudoR2= 0.608		Prob>chi2= 0.0000		

Source: Own econometric result, 2018

Note;\*\*\*, \*\* and \* are statistically significant at 1%, 5% and 10% probability levels respectively.

Off/non-farm income was hypothesized to have a negative effect on the probability of participation in the program. As expected result shows that off/non-farm income affects the probability of participation in the PSNP negatively and significantly at 5% probability level. The marginal effect estimates show that an increase in off/non-farm income by one unit decreases the probability of participating in the program by a factor of 0.02%, keeping all other factors constant. This is justified by the fact that additional income avoids liquidity constraints and solves the problem of food security and the need of support thereby decreasing the participation in the program. This result was in confirmation with Mequanent (2009) who revealed that off/non-farm income job opportunities play prominent role in managing household food security. For those households participated, off/non-farm work has a positive impact on income, food security and hence negatively correlated with the program.

Livestock ownership affected the probability of participation in the PSNP negatively and significantly at 5% probability level. The marginal effect estimates show that an increase in livestock ownership by 1 TLU decreases the probability of participating in the program by a factor of 17.15%. This is because livestock is used as a source of cash to purchase inputs for production and also, get income from sales of livestock and livestock products, which are often use for purchase of food grains during times of food shortage. This result is in consistent with the study findigs of Bogale and Genene (2012) and Shimelis and Bogale (2009) who found livestock ownership positively correlated with well-being and had relatively higher impact which means negative relation with program participation.

Sex of household head has positively and statistically significant (at 10%) relationship with the probability that households' participation in the productive safety net program. The positive sign indicatethat female headed households have been more probability of participation in PSNP. Being female headed household increases, the probability of participation in productive safety net program by 61.19% than being male headed household. This is because female may not go far away from their home for labor or petty trading because of their home responsibilities, cultural norms and other factors related sexual exploitation. In line with this Aman (2013) and Tadesse (2008) found that female headed households to be associated with program participation positively and significantly.

#### **4.2.2. Impact of productive safety net program on household food security and asset building**

##### **4.2.2.1. Estimation of propensity scores**

Logit results of propensity score estimation is presented in Table 6 above. From the estimated coefficients, Table 6 above, more than half of the key variables are statistically significant and carry correct sign. Therefore, the coefficients from this logit model have been used to compute the propensity score for households to receive treatment (the probability of having participating in productive safety net program).

#### 4.2.2.2. Matching Program and Non-Program Households

Three main tasks should be accomplished before one launches the matching task itself. Firstly, estimating the predicted values of program participation (propensity score) for all the sample households in program and control groups (which was done in the previous section) is a most important activity. Secondly, imposing a common support condition on the propensity score distributions of household with and without the program is another important task. In the third stage, discarding observations whose predicted propensity scores fall outside the range of the common support region is subsequently done.

#### 4.2.2.3. Common support region

In setting the common support conditions the minimum and maximum comparison was made. The basic criterion for determining the common support is to remove all observations whose propensity score is smaller than the minimum of the program and larger than the maximum in the opposite group (Caliendo and Kopeinig, 2008).

As shown in Table 7 below the estimated propensity scores vary between 0.0315088 and 0.9999998 (mean=0.8398848) for PSNP participant households and between 6.39e-20 and 0.9785141 (mean=0.1845886) for non PSNP participant (control) households. The common support region would therefore, lies between 0.0315088 and 0.9785141 which means households whose estimated propensity scores are less than 0.0315088 and larger than 0.9785141 are not considered for the matching purpose. As a result of this limitation, 25 participant (treated) households were discarded. Fortunately, all non-participant households lie within common support region. This shows that the study does not have to drop any non-participant households from the sample in computing the impact estimator.

Table 7: Distribution of estimated propensity scores

Group	Obs	Mean	Std. Dev	Min	Max
Total household	155	0.5354891	0.4018186	6.39e-20	0.9999998
Treatment households	83	0.8398848	0.1900227	0.0315088	0.9999998
Control households	72	0.1845886	0.2744442	6.39e-20	0.9785141

Source: Own survey result, 2018

Figure 3 below depicts the distribution of the household with respect to the estimated propensity scores. It shows that most of the treated households were found in the middle and partly in the right side near to middle while most of control households are found in the left side of the distribution. It also reveals that there is wide area in which the propensity score of both the treatment and the control groups are similar.

The distribution of the estimated propensity scores for the above covariates of rural households is presented below in figure 3. In the figure, red colour represents distribution of propensity score of treated households while the green color represents the distribution of propensity score for control households. Most of treated group households have propensity score around 0.9 whereas significant majority of the control households have propensity scores around 0.1.

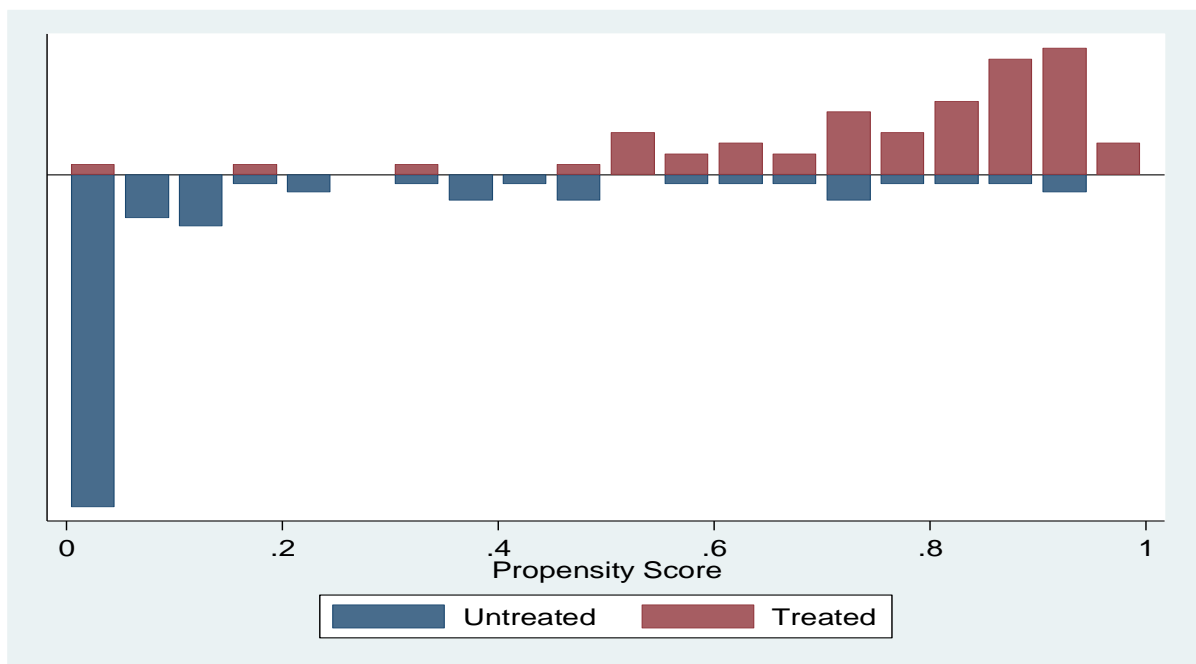


Figure 3: Graph showing the results of common support for treatment and control households

#### 4.2.2.4. Choice of Matching Algorithm

The option on the final choice of an appropriate matching estimator was based on three different criteria as suggested by Dehejia and Wahba (2002). First, equal means test (referred

to as the balancing test) which suggests that a matching estimator which balances all explanatory variables (i.e., results in insignificant mean differences between the two groups) after matching is preferred. Second, looking in to Pseudo-R<sup>2</sup>value, the smallest value is preferable. Third, a matching estimator that outcome in the largest number of matched sample size is preferred.

To sum up, a matching estimator that balances all explanatory variables, with lowest pseudo-R<sup>2</sup>value and produces a large matched sample size is preferable. Table 8 presents the estimated outcome of tests of matching quality based on the three performance criteria. After looking into the result of the matching quality, kernel matching of bandwidth (0.5) was found to be the best for the data at hand to have. Also shows that bandwidth (0.5) was found to be the best for output to outcome indicators variables. Hence, the estimation results and discussion for this study are the direct outcomes of the kernel matching algorithm with a bandwidth (0.5).

Table 8: Matching performance of different estimators

Matching estimators	Performance criteria		
	Balancing test*	Pseud-R2	Matched sample size
<b>Nearest neighbor matching</b>			
NN(1)	9	0.263	130
NN(2)	10	0.188	130
NN(3)	11	0.158	130
NN(4)	10	0.154	130
NN(5)	11	0.144	130
<b>Caliper matching</b>			
0.01	10	0.529	100
0.1	9	0.263	130
0.25	9	0.263	130
0.5	9	0.263	130
<b>Kernel Matching</b>			
Band width 0.01	10	0.517	100
Band width 0.1	11	0.170	130
Band width 0.25	11	0.122	130
Band width 0.5	13	0.106	130

Source: own econometric result, 2018

Note: \* indicates number of explanatory variables with no statistically significant mean differences between the matched groups of treated and control households.

#### **4.2.2.5. Testing the balance of propensity score and Covariates**

Formerly the best performing matching algorithm is chosen, the next task is to check the balancing of propensity score and covariate using different procedures by applying the selected matching algorithm bandwidth (0.5) matching in case of this study. It should be clear that the main intention of estimating propensity score is not to get a precise prediction of selection into treatment. Rather, to balance the distributions of relevant variables in both groups. The balancing powers of the estimations are determined by considering different test methods such as the reduction in the mean standardized bias between the matched and unmatched households, equality of means using t-test and chi-square test for joint significance for the variables used.

Table 9: Propensity score and covariate balance test

Variable	Sample	Mean		bias %	%reduce bias	t-test	
		Treated	Control			t	P> t
Pscore	Unmatched	0.76433	0.18937	239.6		13.3	0.000
	Matched	0.76433	0.76513	-0.3	99.9	-0.02	0.982
Age of household	Unmatched	49.172	49.542	-3.1		-0.18	0.860
	Matched	49.172	53.293	-35.0	-1016	-1.53	0.128
Sex of household	Unmatched	0.0345	0.1389	-29.6		-1.63	0.105
	Matched	0.0345	0.2241	13.3	55.0	1.43	0.156
Household size	Unmatched	7.4138	7.3472	2.9		0.17	0.866
	Matched	7.4138	6.9138	22.1	-651.1	1.16	0.248
Dependency ratio	Unmatched	0.6147	0.3444	60.3		3.46	0.001
	Matched	0.6147	0.6290	-3.2	94.7	-0.16	0.874
Education level	Unmatched	2.3448	4.4861	-68.7		-3.79	0.000
	Matched	2.3448	2.1724	5.5	91.9	0.46	0.643
Land size	Unmatched	0.5345	1.3907	-129.8		-7.04	0.000
	Matched	0.5345	0.5607	-4.0	93.5	-0.55	0.261
Extension advice	Unmatched	3.8103	3.7917	0.4		0.02	0.980
	Matched	3.8103	3.931	-2.8	-546.2	-0.17	0.862
Credit utilized	Unmatched	1077.6	2208.3	-44.8		-2.47	0.015
	Matched	1077.6	944.83	5.3	71.8	0.40	0.692
Market distance	Unmatched	7.2931	5.7917	46.5		2.67	0.009
	Matched	7.2931	8.2069	-28.3	39.1	-1.47	0.145
Off/non-farm incom	Unmatched	619.66	1976.4	-66.9		-3.64	0.000
	Matched	619.66	509.48	5.4	91.9	0.58	0.561
Livestock	Unmatched	2.7776	3.4306	-56.2		-3.11	0.002
	matched	2.7776	2.6088	14.5	74.1	1.03	0.306
Fertilizer use	Unmatched	0.7069	0.8889	-46.2		-2.67	0.009
	matched	0.7069	0.6207	21.9	52.6	0.98	0.330
Improved seed use	Unmatched	0.75862	0.875	-30.2		-1.74	0.085
	matched	0.75862	0.6207	35.8	-18.5	1.61	0.110

Source: Own calculation based on household responses

The balancing powers of the estimations are ensured by different testing methods. Reduction in the mean standardized bias between the matched and unmatched households, equality of means using t-test and chi-square test for joint significance of the variables used are employed here. The fifth column of table 9 above show the mean standardized bias before and after matching, while column six reports the total bias reduction obtained by the matching procedure. The standardized difference in covariates before matching is in the range of 0.4 percent and 129.8 percent in absolute value whereas the remaining standardized difference of covariates for almost all covariates lies between 2.8 percent and 35.8 percent after matching. This is quite below the critical level of 20 percent suggested by Rosenbaum



and Rubin (1985). Hence, the process of matching thus creates a high degree of covariate balance between the treatment and control samples that are prepared to use in the estimation procedure. The same to that, t-tests also reveal that before matching seven of chosen variables exhibited statistically significant differences, while after matching all of the covariates are balanced. As indicated in table 6 the values of pseudo-R<sup>2</sup> are low.

As discussed in the previous section the low pseudo-R<sup>2</sup> value and the insignificant likelihood ratio tests support the hypothesis that both groups have the same distribution in the covariates after matching (Table 10). These results clearly show that the matching procedure is able to balance the characteristics in the treated and the matched comparison groups. Therefore, the results are used to evaluate the impact of PSNP among groups of households having similar observed characteristics. This allowed us to compare observed outcomes for treatment with those of a control group who have the same observable characteristics.

Table 10: Chi-square test for the joint significance of variables

Sample	Pseudo R2	LR chi2	p>chi2
Unmatched	0.522	93.22	0.000
Matched	0.157	25.21	0.033

Source: own econometric result, 2018

All of the above tests suggest that the matching algorithm that has been chosen is relatively best with the data at hand. Consequently, it is possible to precede estimation of ATT for households.

#### 4.2.2.6. Estimation of treatment effect on the treated

The estimated results presented in table 11 below revealed that there was a statistically significant difference between treated and control households in terms of dietary intake and asset building. The NNM, CM, and KM were employed for the matching. The entire estimates gave similar results indicating the robustness of the results. But the overall result of this study is interpreted by using kernel matching coefficient because among the all used matching

estimators, the kernel estimator provides efficient estimation as it is already described in the previous (Choice of Matching Algorithm) section of this document.

The estimation result presented in Table 11 provides supportive evidence that the productive safety net program participation having positive impact on households' food security measured in dietary diversity score. It implies that the dietary diversity intake of PSNP participants on average is substantially higher than the non-participants by a dietary diversity score of 1.40. Meaning, the dietary diversity intake of non-participants would have increased by 1.40 had they been participant in the safety net program or the dietary diversity intake of participants would have decreased on average by 1.40 had they not been beneficiary in the safety net program.

In this respect, the difference between participants and non-participants in dietary diversity intake is significant at 5% probability level. The result revealed that PSNP bridged food gaps with cash or food transfers which support a range of non-farm livelihood activities and increased the availability of food through increased domestic production by ensuring access to food for participant households; and strengthened their emergency response capabilities of households' food security. This enabled participant households to be more benefited from income and food diversification and showed positive impact on food availability and also dietary diversity. Participants in focus group discussion and key informants also mentioned that participant households showed significant improvement in food security. The result is consistent with (Mery, 2016; Aman, 2013 and Yibrah, 2010), who emphasizes the program is determines the household food security.

Similarly, the Productive Safety Net Program has also brought positive impact on asset of the program beneficiary households. There is difference in the mean value of the household assets between program participants and non-participants. Statistically, this was found to be significant at 10% significance level. Results show that participation in the program increased asset of the household by 1808.584 birr higher than the asset of non-participants. This is because the program enabled households to smooth consumption so that they would not need to sell productive assets in order to overcome food shortages. In addition, the public work is also helped to create valuable public goods; moreover, by reducing seasonal liquidity constraints, and stimulated investments as well. This opportunity contributed to households'

asset building for participant groups and showed positive impact on their asset improvement. The result is consistent with Tatwangire (2011), participants reflected significant increases in ownership of livelihood assets such as livestock, equipment, also (Yibrah, 2010; Fitsum, 2013; Berhaneet *al.*, 2011and Mulugeta, 2014). Participants in focus group discussion also pointed out that, beneficiary household showed significant improvement in asset owned; however, they mentioned that the program brought tangible impact on food security than asset ownership.

Table 11: Estimates of the average treatment effect on treated for food security in dietary diversity score and asset in birr

Variable	Matching algorithm	Treated	Control	ATT	S.E	T-value
Household food security (DDS)	Nearest neighbor Matching	5.8793	4.5104	1.3689	0.645161	2.12**
	Caliper matching	5.8793	4.1552	1.7241	0.734912	2.35**
	Kernel matching	5.8793	4.4835	1.3958	0.5513096	2.53**
Household asset (Birr)	Nearest neighbor Matching	6530.453	4041.992	2488.461	946.70843	2.63**
	Capiler matching	6530.453	3790.982	2739.471	1178.5155	2.32**
	Kernel matching	6530.453	4721.869	1808.584	990.32003	1.83*

**Source:** Econometric result, 2018

#### 4.2.2.7. Sensitivity Test

In order to check for unobservable biases, sensitivity analysis was performed using Rosenbaum Bounding approach on the computed outcome variable. Sensitivity analysis was

carried out to check quality of comparison matching among treated and untreated group with observed covariates and mainly to check robustness of unobserved covariates. If there are unobserved variables that simultaneously affect assignment into treatment and the outcome variable, a hidden bias might arise to which matching estimators are not robust (Rosenbaum, 2002).

However, the results indicated in Table 12 shows that the inference of the effect of the program is not changing though the beneficiary and non-beneficiary household have been allowed to differ in their odds of being treated up to 219 percent (maximum value of gamma 3 with 0.1 increments) in terms of unobserved covariates. That means for food security and asset of household or ATT of each outcome variables were estimated at various levels of critical values of gamma. The p-critical values are significant which further indicated that we have considered important covariates that affected both participation and outcome variables. We couldn't get the critical value gamma where the estimated ATT is questioned even if we have set gamma largely up to 3. As a result, it can safely be concluded that our impact estimates (ATT) of food security and asset holding were insensitive to unobserved selection bias and were the result of pure effect of the productive safety net program.

Table 12: Result of Sensitivity test for estimated significant ATT results

Outcome	$e^\gamma = 1$	$e^\gamma = 1.5$	$e^\gamma = 2$	$e^\gamma = 2.19$
Household asset	0.000175	0.009437	0.061937	0.098388
Dietary intake	0.000175	0.009437	0.061937	0.098388

Source: own survey result, 2018

$\gamma$ (Gamma) = log odds of differential assignment due to unobserved factor

## 5. SUMMARY, CONCLUSION AND RECOMMENDATIONS

### 5.1. Summary and Conclusion

Chronic food insecurity has been a defining feature of poverty that has affected millions of Ethiopians for years. The study examined the impact of productive safety net program on rural household food security and asset building in Misha Woreda Hadiya Zone Southern Nations Nationalities and Peoples region. The specific objectives of the study include evaluating the impact of PSNP on rural households' food security; evaluating the impact of PSNP on rural households' asset building and identifying factors affecting participation in productive safety net program of households.

The data were generated from both primary and secondary sources. The data was collected from randomly selected productive safety net program participant and non-participant of households. The primary data for this study was collected from 155 households by using a semi-structured questionnaire. In addition, data collected from different secondary sources were used.

Descriptive statistic with appropriate statistical tests, logit model and propensity score matching methods were used to analyze the data. A t-test and chi-square were performed to statistically compare the mean and percentage difference between the two groups of households. The output of the descriptive statistics pointed out that there were significant differences between households who have participant on the safety net program and those who do not have participant on the program in terms of education level, dependency ratio, land size, credit utilization, distance from nearest market, off/non-farm income, livestock ownership, chemical fertilizer use and improved seed use of households.

The logistic regression model indicated that, seven variables were significant in influencing the dependent and outcome variables. The significant variables in the model were Age, dependency ratio, educational level, land size, off/non-farm income, total livestock and sex of the household head.

After controlling for confounding factors, the original 83 treatments and 72 control sampled households were conditioned in such a way that 58 treatment households were matched with

72 controls using kernel matching estimator with band widths of 0.5. The result showed that only 130 sample households were identified to be measured in the estimation process after discarding households whose propensity score value is out of the common support region.

After controlling for other characteristics, program participation has brought significant positive impact on participating households: food security increased by 31% and households' asset also increased by 38%. Hence, ATT result shows that participation in productive safety net program in Misha Woreda had brought positive and significant impact regarding to both outcomes as compared participant household to non-participants.

## **5.2. Recommendations**

Based on the findings of this study, the following recommendations are forwarded:

The econometric results showed that age of household head negatively influenced the probability of participation on PSNP. Hence, in order to benefit other non-participant younger household heads, policy makers and leaders of the program should focus on redistribution or facilitating access to resources or factors of production; Land, credit and livestock opportunities.

Participation into the program was positively influenced by dependency ratio; therefore, it would be good to give awareness or training on family planning.

Education negatively influenced the probability of participation in productive safety net program. Therefore, policy makers should give more attention to improve access to education and training availability for farmers.

Land size negatively affected participation in PSNP. Hence, government and other concerned bodies should focus on income diversification and productivity improvement activities for lower size land owners and give attention to improve access to land, clear land marketing (contract) should be established.

Participation in off/non-farm activities negatively influenced the probability of PSNP participation. Therefore, expansion of non-farm activities by equipping households with the necessary materials and business knowledge will help poor and non-beneficiary households.

Livestock negatively influenced the probability of participation in productive safety net program. Hence, more support by government is needed to encourage expansion of livestock production and productivity improvement through providing forage and health center facilities and; households with lower livestock should be carefully considered during selection of beneficiaries.

Sex of household head found to have positive relationship with the participation of households in productive safety net program. This indicates that increasing the female headed household in rural area increasing participating in productive safety net program. Therefore, high emphasis should be given by PSNP, governmental and NGOS to improve livelihood of female headed households by facilitating small enterprises and off-farm activities in the district.

On a positive note, this study has found evidence that the PSNP in the study area has worked in significantly increasing household food security and asset building. Therefore, all necessary support should be provided from the government and other funding organizations in order to improve their performance and outreach as well as to improve the extent and kind of impacts towards food insecurity alleviation.

In general, the importance of productive safety net program in improving livelihood is of massive benefit to the participant households in the district. Therefore, there is the need to sustain it and help its growth as its role to the development of the Misha Woreda and the country at large is very important. Therefore, the program should be encouraged by the government and other concerned bodies in order to benefit other non-participant resource poor households in future.

## REFERENCES

- ADB (Asian Development Bank), 2006. Impact evaluation: methodological and operational issues. Economic and Research Department Addis Ababa, Ethiopia.
- Adenew, B. and Pender, J., 2004. The food security role of agriculture in Ethiopia. *Journal of Agricultural and Development Economics*, 1(1), pp.138-153.
- Adimassu, Z., Kessler, A. and Hengsdijk, H., 2012. Exploring determinants of farmers' investments in land management in the Central Rift Valley of Ethiopia. *Applied Geography*, 35(1-2), pp.191-198.
- Aman, T., 2013. Impact of Productive Safety Net Program on Households' food security and asset building: The Case of ZuwayDugda District Oromia Regional State, Ethiopia. Thesis submitted to Haramaya University.
- Anderson, C., Kekkonen, A. and Stage, J., 2011. Impacts of the Productive Safety Net Program in Ethiopia on livestock and tree holdings of rural households. *Journal of Development Economics*, 94(1), pp.119-126.
- Asefa, S., 2003. Rural poverty, food insecurity and environmental degradation in Ethiopia: A case study from south central Ethiopia. *International journal of Ethiopian studies*, pp.59-89.
- Bazezew, A., 2012. Determining Food Security Indicators at Household Level in Drought Prone Areas of the Amhara Region of Ethiopia: The Case of Lay Gaint District, Amhara Regional State. *Ethiopian Journal of Environmental Studies and Management*, 5(4), pp.422-434.
- Baker, J., 1999. Evaluating the poverty impact of projects: A Handbook for practitioners. *LCSPR/PRMPO. The World Bank*.
- Baker, J.L. and Caliendo, M., 2000. Evaluating the impact of the Development Projects on Poverty: A Handbook for Practitioners: Washington, D.C.: *The World Bank (Directions in Development)*.
- Baker, J.L., 2000. *Evaluating the impact of development projects on poverty: A handbook for practitioners*. World Bank Publications.
- Becker, S.O. and Ichino, A., 2002. Estimation of average treatment effects based on propensity scores. *The stata journal*, 2(4), pp.358-377.
- Berhane, G., Gilligan, D.O., Hoddinott, J., Kumar, N. and Taffesse, A.S., 2014. Can social protection work in Africa? The impact of Ethiopia's productive safety net programme. *Economic Development and Cultural Change*, 63(1), pp.1-26.



- Berhane, G., Hoddinott, J., Kumar, N. and Taffesse, A.S., 2011. The impact of Ethiopia's productive safety nets and household asset building programme: 2006–2010. *Washington, DC: International Food Policy Research Institute.*
- Bigsten, A., Kebede, B., Shimeles, A. and Tadesse, M., 2003. Growth and poverty reduction in Ethiopia: Evidence from household panel surveys. *World development*, 31(1), pp.87-106.
- Bogale, A. and Genene, W., 2012, August. Impact of productive safety net financed livestock credit on food security and poverty status of rural households in Ethiopia: A simulation approach. In *Proceedings of Triennial Conference of International Association of Agricultural Economists (IAAE), Foz du Iguacu, Brazil, 18th-24th August.*
- Bryson, A., Dorsett, R. and Purdon, S., 2002. The use of propensity score matching in the evaluation of active labour market policies.
- Caliendo, M. and Kopeinig, S., 2005. Some Practical Guidance for the Implementation of Propensity Score Matching: *Discussion Paper No. 1588. University of Cologne.*
- Caliendo, M. and Kopeinig, S., 2008. Some practical guidance for the implementation of propensity score matching. *Journal of economic surveys*, 22(1), pp.31-72.
- Croppenstedt, A., Demeke, M. and Meschi, M.M., 2003. Technology adoption in the presence of constraints: the case of fertilizer demand in Ethiopia. *Review of Development Economics*, 7(1), pp.58-70.
- Dehejia, R.H. and Wahba, S., 2002. Propensity score-matching methods for nonexperimental causal studies. *Review of Economics and statistics*, 84(1), pp.151-161.
- Department for International Development (DFID), 2007. *Guaranteeing Food and Money: A Safety Net for Ethiopia's Poor.*
- Drewnowski, A., Renderson, S.A., Driscoll, A. and Rolls, B.J., 1997. The Dietary Variety Score: assessing diet quality in healthy young and older adults. *Journal of the American Dietetic Association*, 97(3), pp.266-271.
- Endalew, B., Muche, M. and Tadesse, S., 2015. Assessment of food security situation in Ethiopia: A Review. *Asian J Agric Res*, 9(2), pp.55-68.
- Eneyew, A., 2008. Livelihood strategies and food security in Wolayita, Southern Ethiopia: the case of Boloso Sore district. *An MSc thesis Submitted to the School of Graduate Studies of Haramaya University.*
- Ezemenari, K., Rudqvist, A. and Subbarao, K., 1999. Impact evaluation: A note on concepts and methods. *World Bank Poverty Reduction and Economic Management Network, procesado. Washington, DC: Banco Mundial.*
- FAO. 2006. *The State of Food Insecurity in the World 2006* (Rome: FAO, 2006), pp. 23.

- FAO. 2010. Crop and Food Security Assessment Mission to Ethiopia. FAO: Rome.
- FAO. 2011. *Guidelines for Measuring Household and Individual Dietary Diversity*.
- FAO. 2013). *Guidelines for measuring household and individual dietary diversity*. Rome. Retrieved from [http://agrobiodiversityplatform.org/files/2011/05/guidelines\\_MeasuringHousehold.pdf](http://agrobiodiversityplatform.org/files/2011/05/guidelines_MeasuringHousehold.pdf).
- FAO. 2014. The State of Food Insecurity in the World: Strengthening and enabling environment to improve food security and nutrition. Rome .
- FAO/UN. 2007. Developing food-based dietary guidelines: a manual from the English speaking Caribbean. Rome 1-85.
- FDRE, M., 2006. National reproductive health strategy: 2006-2015. *Department of FH. Addis Ababa: Ministry of health*.
- Federal Democratic Republic of Ethiopia (FDRE), 1996. Food Security Strategy 1996. Addis Ababa.
- Feleke, S.T., Kilmer, R.L. and Gladwin, C.H., 2005. Determinants of food security in Southern Ethiopia at the household level. *Agricultural Economics*, 33(3), pp.351-363.
- Fikadu, Y., 2014. Impact of Productive Safety Net Program (PSNP) on Food Security in Ethiopian Somali Region: The Case of Keberibeyah Woreda.
- Fisseha, K., 2014. Food insecurity and the relative importance of various household assets.
- Fitsum, A., 2013. *Assessing the Impact of Productive Safety Net Program on Asset Building and Sustainable Land Management Practices: A Cross-Sectional Analysis from Eastern Hararghe, Haramaya* (Doctoral dissertation, Mekelle University).
- Food and Nutrition Technical Assistance (FANTA), 2006. Household Dietary Diversity Score (HDDS) for Measurement of Household Food Access: Indicator Guide.
- Gibson, R.S., 2005. *Principles of nutritional assessment*. Oxford university press, USA.
- Gilligan, D.O., Hoddinott, J. and Taffesse, A.S., 2008. An analysis of Ethiopia's Productive Safety Net Program and its linkages. *Washington, DC: International Food Policy Research Institute*.
- Gilligan, D.O., Hoddinott, J., Kumar, N.R. and Taffesse, A.S., 2009. Impact of Social Protection on Food Security and Coping Mechanisms: Evidence from Ethiopia's Productive Safety Nets Program.
- Gujarati, D. and Porter, D., 2003. Multicollinearity: What happens if the regressors are correlated. *Basic econometrics*, 363.

- Gujarati, D.N., 2004. Basic econometrics. Student solutions manual for use with Basic econometrics.
- Gebresilassie, Y.H., 2013. Graduation Determinants of Productive Safety Net Program Beneficiary Households: A Logistic Analysis, Tigray-Ethiopia. *European Journal of Business and Economics*, 8(4).
- Hadijah, A. Mbwana<sup>1</sup>, Joyce Kinabo<sup>1</sup>, Christine Lambert and Hans K. Biesalski., 2016. Determinants of household dietary practices in rural Tanzania: Implications for nutrition interventions.
- Hassen, B., 2012. Poverty and Food security Analysis at farm household level in South Wollo, Wollo University, Ethiopia.
- Hatloy, A., Torheim, L.E. and Oshaug, A., 2000. Food variety a good indicator of nutritional adequacy of the diet? A case study from an urban area in Mali, West Africa. *European Journal of Clinical Nutrition*, 52(12), p.891.
- Hayalu, G., 2014. *Assessment of Factors Affecting Household Level Graduation from Productive Safety Net Program (PSNP): Evidence from Emba-Alaje District Southern Tigray, Northern Ethiopia* (Doctoral dissertation, Mekelle University).
- Hermela, M., 2015. An Assessment of the Role of Productive Safety Net Program on Household Resilience: The case of Dodota District of Oromiya Region, Addis Ababa University.
- Hiwot, Y.A., 2014. Determinants of Food Security in Rural Farm Households in Ethiopia.
- Hoddinott, J. and Yohannes, Y., 2002. Dietary diversity as a food security indicator. *Food consumption and nutrition division discussion paper*, 136(136), p.2002.
- Hoddinott, J., 2001. *Methods for rural development projects: food security in practice (No.1)*. International food policy research institute (IFPRI).
- Jalan, J. and Ravallion, M., 2003. Does piped water reduce diarrhea for children in rural India?. *Journal of econometrics*, 112(1), pp.153-173.
- Jrad, S., B. Nahas and H. Baghasa, 2010. Food security models. Policy Brief No. 33, Ministry of Agriculture and Agrarian Reform, National Agricultural Policy Center, Syrian Arabic Republic, August 2010, pp: 1-32.
- Khush, G.S., Lee, S., Cho, J.I. and Jeon, J.S., 2012. Biofortification of crops for reducing malnutrition. *Plant biotechnology reports*, 6(3), pp.195-202.
- Mamo, T., 2011. *Impact Of Productive Safety Net Program On Asset Accumulation And Sustainable Land Management Practices In The Central Rift Valley: The Case Of Adamitulu Jido Kombolcha And Meskan Woredas*. An M.Sc (Doctoral dissertation, M.Sc. thesis, Departement of Economics, Haramaya University).

- Mary, A., 2016. The Practices and Impact of Productive Safety Net Program (PSNP) on the Household Income of Smallholder Farmers: The Case of Tula Sub-City, Southern Region, Ethiopia. *Master's Thesis, Addis Ababa University, Ethiopia.*
- Maxwell, S. and Smith, M., 1992. Household food security: a conceptual review. *Household Food Security: concepts, indicators, measurements. Edited by S. Maxwell and T. Frankenberger. Rome and New York: IFAD and UNICEF.*
- Mequanent, M., 2009. Determinants of household food security and coping strategy: The case Adaberga Woreda, Ethiopia. *Master's Thesis, Haramaya University, Dire Dawa, Ethiopia.*
- Ministry of Agriculture and Rural Development (MoARD), 2009. Productive Safety Net Program. Program Implementation Manual. MoARD: Addis Ababa.
- Ministry of Agriculture and Rural Development (MoARD), 2010. Household Asset Building Program. Program Implementation Manual. MoARD: Addis Ababa.
- Ministry of Agriculture and Rural Development (MoARD), 2010. Food Security Program 2010 – 2014, Productive Safety Net Program, Addis Ababa, Ethiopia.
- Ministry of Agriculture, 2010. Productive Safety Net Program Implementation Manual. Addis Ababa, Ethiopia.
- Ministry of Finance and Economic Development (MoFED), 2002. Development and poverty profile of Ethiopia, welfare monitoring unit, Addis Ababa.
- Ministry of Finance and Economic Development (MoFED), 2012. An Interim Report on Poverty Analysis Study (2010/11): Federal Democratic Republic of Ethiopia, Development Planning and Research Directorate. March 2012, Addis Ababa, Ethiopia.
- Ministry of Labor and Social Affairs (MoLSA), 2012. National Social Protection of Ethiopia. Addis Ababa, Ethiopia.
- Misha woreda office of Agriculture and Natural Resource (MWOANR), 2017. Annual Report.
- Misha Woreda Finance and Economy Development Organization (MWFEDO), 2017. Misha Woreda finance and economy development organization yearly socio-economic report.
- Mohamed, A.A., 2017. Food security situation in Ethiopia: a review study. *Int J Health Econ Policy*, 2(3), pp.86-96.
- Mulugeta, G., 2014. Impact of productive safety net program on rural household food security and asset holding: The case of Gurgura district, Dire Dawa Administration, Haramaya University, Ethiopia.
- Mundial, B., 2010. Designing and Implementing a Rural Safety Net in a Low Income Setting: Lessons Learned from Ethiopia's Productive Safety Net Program 2005–2009.

- National Bank of Ethiopia (NBE), 2014/15. Annual Report.
- Okoyo, E.N. and Shumye, H., 2014. *Impact of Productive Safety Net Program on Household Asset protection and Creation: The Case of Rural Kebeles of Dire-Dawa Administration, Ethiopia* (Doctoral dissertation, Haramaya University).
- Omoto, W., 2003. Impact assessment of urban agriculture research and development in Nairobi. *Department of Research Development Nairobi Kenya*.
- Porter, C., 2010. Safety nets or investment in the future: Does food aid have any long-term impact on children's growth?. *Journal of International Development*, 22(8), pp.1134-1145.
- Pradhan, M. and Rawlings, L.B., 2002. The impact and targeting of social infrastructure investments: Lessons from the Nicaraguan Social Fund. *The World Bank Economic Review*, 16(2), pp.275-295.
- Ravallion, M., 2005. *Evaluating anti-poverty programs policy research (No. 3625)*. Working Paper.
- Riely, F., Mock, N., Cogill, B., Bailey, L. and Kenefick, E., 1999. Food security indicators and framework for use in the monitoring and evaluation of food aid programs. *Nutrition Technical Assistance Project (FANTA), Washington, DC*.
- Rosenbaum, P.R. and Rubin, D.B., 1983. The central role of the propensity score in observational studies for causal effects. *Biometrika*, 70(1), pp.41-55.
- Rosenbaum, P.R. and Rubin, D.B., 1985. Discussion of "On State Education Statistics": A difficulty with regression analyses of regional test score averages. *Journal of Educational Statistics*, 10(4), pp.326-333.
- Rosenbaum, P.R., 2002. Observational studies. In *Observational studies (pp. 1-17)*. Springer, New York, NY.
- Rubin, 1983. Reducing bias in observational studies using sub classification on the propensity score: *Journal of the American statistical association September, volume 79, number 387 Application section*.
- Ruel, M.T., 2003. Is dietary diversity an indicator of food security or dietary quality? A review of measurement issues and research needs. *Food and Nutrition Bulletin*, 24(2), pp.231-232.
- Shimeles, M., 2009. Impacts of productive safety net program on households assets protection. *The case of Habru and Ambasel districts in Amhara Region, Ethiopia*.
- Shimelis, A. and Bogale, A., 2009. Household level determinants of food insecurity in rural areas of Dire Dawa, Eastern Ethiopia. *African Journal of Food, Agriculture, Nutrition and Development*, 9(9).

- Sila, O. and Pellokila, R. 2007. Socio-Economic indicators affecting food security. *University of Philippines at Los Banos*.
- Southern Agricultural and Rural Development Bureau (SARDB), 2010. Annual report.
- Storck, H., Emanu, B., Adnew, B. and Borowiecki, A.A., Shimelis W/Hawariat, 1991. *Farming systems and Farm Management Practices of Small-holders in the Hararghe Highlands.* "Farming system and resource Economics in the Tropics, 11.
- Tadesse, Y., 2008. Assessment of the impact of the productive safety net program on household welfare: The case of Adami Tulu Jido Kombolcha woreda, Oromia Region, Ethiopia. *Master's Thesis, Addis Ababa University, Ethiopia*.
- Tatwangire, A., 2011. Access to productive assets and impact on household welfare in rural Uganda.
- Temesgen, A., 2014. *Impact of Productive Safety Net Program on Farm Households' Food Security and Asset Building: The Case of Alaba Special Woreda of Southern Nations, Nationalities and People's Region, Ethiopia* (Doctoral dissertation, Haramaya University).
- Tesfaye, A., Bogale, A., Namara, R.E. and Bacha, D., 2008. The impact of small-scale irrigation on household food security: The case of Filtino and Godino irrigation schemes in Ethiopia. *Irrigation and Drainage Systems*, 22(2), pp.145-158.
- Tizale, C.Y., 2007. *The dynamics of soil degradation and incentives for optimal management in the Central Highlands of Ethiopia* (Doctoral dissertation, University of Pretoria).
- UNICEF., 2014. Ethiopia humanitarian situation report .[http://www.unicef.org/ethiopia/UNICEF\\_Ethiopia\\_SitRep\\_3\\_May\\_and\\_June\\_2014\\_.pdf](http://www.unicef.org/ethiopia/UNICEF_Ethiopia_SitRep_3_May_and_June_2014_.pdf).
- Uraguchi, Z.B., 2012. Rural income transfer programs and rural household food security in Ethiopia. *Journal of Asian and African studies*, 47(1), pp.33-51.
- USAID, 2002. The Impact of Title II Food Aid on Food security in Ethiopia. Food and Humanitarian Affairs Office. USAID: Addis Ababa.
- WFP, 2014. Global food security update: Tracking food security trends in vulnerable countries. World Food Programme, Issue 13, February 2014. <http://documents.wfp.org/stellent/groups/public/documents/ena/wfp262707.pdf>.
- World Bank (WB), 2004. Project Appraisal Document for a Productive Safety Net Project. Report No. 29767. ET. Washington, D.C., World Bank.
- World Bank (WB), 2009. Productive Safety Net Phase III project in support of the third phase of the productive safety net program.

Yamane, T, 1967. Statistics, an introductory analysis, 2nd edition: Harper and Row Inc, New York. 345p.

Yibeltal, F., 2008. The Impact of Ibnat-Belessa Integrated Food Security Program on Household Food Poverty. *An MSc Thesis Presented to the School of Graduate Studies of Alemaya University. p, 78.*

Yibrah, H., 2010. Impact of Productive Safety Net Program on the Rural Households asset Protection and Consumption. Submitted in Partial Fulfilment of the Requirements for the Award of Master of Science Degree.

## APPENDICES

### Appendix 1: Appendix Tables

Appendix Table 1: Conversion factor of livestock number into Tropical Livestock Unit (TLU)

Livestock Category	TLU
Ox	1
Cow	1
Mule	1.1
Heifer	0.75
Calf	0.25
Donkey	0.7
Horse	1.1
Sheep	0.13
Goat	0.13
Chicken	0.013

Source: Storck, *et al.*, 1991

Appendix Table 2: Multicollinearity test for continuous explanatory variable

Variables	VIF	1/VIF
Age of households	1.266	0.790
Household size	1.166	0.858
Dependency ratio	1.167	0.857
Education level	1.286	0.778
Land size in hectare	1.345	0.743
Extension contact	1.112	0.899
Credit utilities	1.047	0.955
Market distance	1.121	0.892
Off/non-farm income	1.142	0.876
Livestock ownership	1.197	0.836
Mean VIF	1.18	

Source: Own survey result, 2018

Appendix Table 3: Contingency coefficient for discrete explanatory variables included in model

	Fertilizer use	Improved seed use	Sex pf household
Fertilizer use	1.0000		
Improved seed use	0.6298	1.0000	
Sex of household	0.0558	-0.1045	1.0000

Source: Own survey result, 2018



Appendix Table 4: Support and off support region of respondent households

Psmatch2: Treatment Assignment	Psmatch2: Common		Total
	Off support	On support	
Untreated	0	72	72
Treated	25	58	83
Total	25	130	155

Source: own survey result, 2018

Appendix 2: Data collection tools

A. General information

1. Name of Kebele \_\_\_\_\_ 2. Village \_\_\_\_\_  
 3. Name of enumerator \_\_\_\_\_ 5. Signature \_\_\_\_\_ 6. Date of interview \_\_\_\_\_

1. Household characteristics

- 1.1. Name of HH Head \_\_\_\_\_  
 1.2. Age \_\_\_\_\_  
 1.3. Sex 1. Female 2. Male  
 1.4. Marital status of household head? 1. Single 2. Married 3. Divorced  
 4. Widowed  
 1.5. Household size \_\_\_\_\_  
 1.6. Number of persons in household below age of 15 years: \_\_\_\_\_  
 1.7. Number of persons in household above age of 65 years: \_\_\_\_\_  
 1.8. Educational status of household 1. Illiterate 2. Basic (read and write) 3. Literate  
 1.9. If literate, what is the level of formal education completed by the household head in years? \_\_\_\_\_  
 1.10. What is your religion? 1. Orthodox 2. Muslim  
 3. Protestant 4. Catholic 5. Other (specify) \_\_\_\_\_  
 1.11. Main occupation/activity  
 1. No occupation 2. Farming 3. Handicraft 4. Daily labor  
 5. Petty trade 6. Student 7. Unemployed 8. Govt sector 9. Others (Specify) \_\_\_\_\_

2. Land ownership

2.1. Do you have your own land? 1) Yes 2) No

2.2. If yes to question 2.1, please tell me your farm size and land use pattern on below (in timad)

Total farm size	Cultivated land	Plantation	fallow land/	Homestead	Pasture land	Rented out	Rented in

3. Crop production

3.1. What are major crops grown in last year?

Crops	Production in Qts.	How many quintals were		
		Consumed at Home	Sold	Price per Qt Sold( <i>Birr</i> )
Wheat				
Barley				
Enset				
Pea				
Bean				
Maize				
Teff				
Vegetable				
Fruits				
Others				

3.2. Did you use fertilizer to improve your farm's productivity in the past? 1) Yes 2) No

3.3. If yes, for how many years? \_\_\_\_\_ Years

3.4. Did you use improved seed to improve productivity of your farm in the past?

1) Yes 2) No

3.5. If yes 3.4, for how many years? \_\_\_\_\_ Years

4. Access to Extension Service, Market and Credit Services

4.1. Have you received extension service from any government and /NGOs on crop or animal production during the last12 month? 1) Yes 2) No

4.2. If yes to question 4.1, how many times per a year? \_\_\_\_\_

4.3. Did you receive any type of credit in the last years? 1) Yes 2) No

4.4. If yes to question4.3, how much credit was it that you borrowed? \_\_\_\_\_ ETB

4.5. How much far is the nearest market center in Kilometers from your home? \_\_\_\_\_ Km.

5. Household income

5.1. Did you participate in off/non-farm income 1) Yes 2) No

5.2. If yes to question 5.1, what was the estimated annual off/non-farm income of the household last year in birr?

No	Income source	Annual income
1	Casual work/sale labor	
2	Hand craft	
3	Petty trading	
4	Remittance	
5	Other	
	Total	

5.3. Did you participate in on-farm income 1) Yes 2)No

5. 4. If yes to question 5.3, the estimated amount of annual farm income of the household last year (2016/17)

Nº	Income source	Annual income
1	Crop production	
2	Fruit production	
3	Vegetable	
4	Trees	
5	Animals and its product sales	
6	Land rented out	
	Total	

6. Food security conditions

6.1. During the last year (12 months), did your household suffer any shortage of food to eat?

1. Yes 2. No

6.2. If yes, how is it compared to back 5 year? 1. Better 2. Worse 3.No change 4.I don't know

6.3. Was yesterday a normal day for your household regarding food consumption?

1) Yes 2)No

6.4. If 'Yes' to this question 6.3, please go on to the last question to fill the 24-hour recall for household consumption in question 6.6.

6.5. If No 6.3 to the above question, please tell us what was special regarding your food consumption yesterday:

1. I had no food at all
2. I had only little food (because of fasting during half day, during the day.)
3. I had more food than normal (because of a feast, celebration etc.)
4. other, specify \_\_\_\_\_

6.6. Please tell me any of food groups consumed by household members in your home last day

No	Food group	Examples of food items	Consumed? 1, if consumed 0, if not
1	Cereals	Maize, rice, wheat, sorghum, millet or any other foods made from grains (e.g. bread, injera, genfo , nifiro, kolo )	<b>A=</b> _____
2	Root and Tubers	sweet potatoes, potatoes, yams, cassava, hamichoenset, or other foods made from roots and tubers	<b>B=</b> _____
3	Vegetables	Tomato, onion, Garlic including wild vegetables, Cabbages	<b>C=</b> _____
4	Any fruits	Mango, Avocado, Papaya, banana and others	<b>D=</b> _____
5	Flesh Meats	Any beef, pork, lamb, goat, rabbit wild game, chicken, duck, or other birds, liver, kidney, heart, or other organ meats?	<b>E=</b> _____
6	Any eggs	Hens eggs	<b>F=</b> _____
7	Fish	Any fresh or dried fish	<b>G=</b> _____
8	Any food from Pulses	beans, peas, lentils, nuts, seeds or foods made from these	<b>H=</b> _____
9	Dairy products	Milk, cheese, yogurt or other milk products	<b>I=</b> _____
10	Oils and Fats	Any foods made with oil, fat, or butter?	<b>J=</b> _____
11	Sweets	Sugar, honey, sweetened soda or sugary foods such as chocolates, candies, cookies and cakes	<b>K=</b> _____
12	Spices, Condiments, Beverages	coffee, tea, alcoholic beverages and others	<b>L=</b> _____

## 7. Asset protection and building

7.1. Which and how much of the following assets do your household own? (If none write '0')

Asset	Number owned today	Cost of replacing one [Birr]
Livestock assets		
Oxen		
Cows		
Heifers		
Calves		
Sheep		
Goats		
Donkeys		
Horse		
Mule		
Poultry		
Asset	Number owned today	Cost of replacing one [Birr]
Productive assets		
Plough (maresha)		
Sickle (machid)		
Pick axe (doma)		
Axe (metrebia)		
Hoe (mekotkocha)		
Spade (akefa)		
Traditional beehive (yenibqafa)		
Modern beehive		
Water pump (hand/foot)		
Other specify _____		
Consumer durables		
Television		
Mobile telephone		
Radio		
Bed		
Mattress (frash)		
Chairs		
Tables		
Charcoal stove		
House (in town and/or at rural area)		
Saving amount		

## 8. Some Welfare and Welfare Change Indicators

8.1. What do you say about your general living standard of today compared to before 2005?

1. The same 2. Deteriorated

3. Improved 4. Other \_\_\_\_\_

8.2. What improvement in service as compared to the situation before 2005 has been most useful to you? 1. New or improved roads 2. Better sanitation 3. Better water supplies

4. Better health care 5. Better schooling 6. Better housing

7. None 8. Others \_\_\_\_\_

8.3. How do you cover the gap of income shortage?

1. Own labor income 2. Sell assets

3. Loan from relative or family 4. Moneylender 5. Others \_\_\_\_\_

8.4. What are the reasons for the income shortage? \_\_\_\_\_

8.5. Have you experienced food shortage for the last year? 1) Yes 2) No

8.6. If yes, for how many months and which month too? \_\_\_\_\_

8.7. If yes, how do you cover the deficit?

1. Relief aid 2. Borrowing 3. Gift 4. Migrate 5. Sale of assets

6. Others \_\_\_\_\_

8.8. Has this household received food aid in times of food shortage? 1) Yes 2) No

8.9. How do you think life will be in your family/community one year from now?

1. Much better 2. Somewhat better

3. about the same 4. Somewhat worse 5. Much worse

8.10. Have you encountered any shocks? 1) Yes 2) No

8.11. If yes to question 8.10, which of the followings? (Choose from the options)

A/ Illness/death shock B/ Livestock loss shock

C. Weather shock D/ Pest/theft/disease E/ Any other shock

9. About the Program (for beneficiaries only)

9.1. Do you participate in Productive Safety Net Program (PSNP)? Yes  No

9.2. If yes to question 9.1, in which component of the PSNP?

1. Public Work (PW) 2. Direct Support (DS)

9.3. What is the effect of the support on your family?

1. It has improved our food supply

2. I have bought assets

3. Am growing more crops

4. I do not have to sell my assets anymore

5. I am able to produce surplus to market

6. No effects

7. Others, specify \_\_\_\_\_

9.4. In which of the following PSNP/PW activities you participated?

1. Road Construction and Rehabilitation
2. Water Supply
3. Waste Disposal, Sanitation and Health
4. Land Tenure
5. Small scale Irrigation and dams
6. Reforestation and Natural Regeneration
7. Watershed Treatment (Soil and Water Conservation) and Water Harvesting
8. Agricultural Production
9. Others, Specify \_\_\_\_\_

9.5. How much money was paid for your productive in the PW? \_\_\_\_\_ Birr.

9.6. Have you received Remittance from somewhere?

Yes  No

9.7. If yes how much was it and from whom you received? \_\_\_\_\_

9.8. How much money you received from the PSNP/DS? \_\_\_\_\_ Birr.

9.9. Do you participate in Other Food Security Program (OFSP)?

Yes  No

9.10. If yes to question 9.9, which of the following benefits have you got from OFSP?

1. Access to credit
2. Assistance in obtaining livestock and bees
3. Improvements in pasture land
4. Seeds
5. Irrigation or water-harvesting
6. Soil conservation
7. Others, specify \_\_\_\_\_

9.11. Have you taken credit from Household Asset Building Program (HABP)?

Yes  No

9.12. If yes to question 9.11, how much was it? \_\_\_\_\_

9.13. Have you bought new items in the last five years (Since participated in PSNP)?

Yes  No

9.14. For how many years did you participate in the PSNP? \_\_\_\_\_ since when \_\_\_\_\_?

9.15. On your opinion, in which of the following parameters did the PSNP has an impact?

1. Creating access to education
2. In improving human health
3. In improving animal health
4. In improving roads to health center, market
5. In improving sanitation & hygiene
6. In increasing income
9. Others (Specify) \_\_\_\_\_

Thank you for your time!

**Checklist for key informant interview for Misha district early warning and food security office manager and employees**

Name: \_\_\_\_\_

Sex: \_\_\_\_\_

Age: \_\_\_\_\_

Position: \_\_\_\_\_

Date: \_\_\_\_\_

1. When does PSNP started in the Woreda?
2. How does beneficiary households identified for PSNP?
3. What mechanisms have been used to identify households either for direct support or public work?
4. What outcomes registered because of PSNP implementation or contribution it brought for the beneficiary households and at community level?
5. What criterias used for graduation of beneficiaries from the program?
6. How was the integration between PSNP and other food security programs of GO and NGOs?
7. Were there challenges in targeting and implementing process? What challenges do you face?
8. What do you recommend on local governments, NGO's and community role to achieve PSNP objective and alleviate the problems with it?
9. What do you suggest on building successful PSNP transfers in order to reduce household vulnerability and contribute towards the improvement of the household food security and asset building in the study area in the future?

Thank you for your time!



## Check List for Focus Group Discussion

FGD Identification number \_\_\_\_\_

Date of discussion \_\_\_\_\_

1. How is food insecurity condition in the kebele/woreda and how long it is recognized as food insecure?
2. What are the root causes of food insecurity in the kebele/Woreda?
3. How was selection of HHs for program participation?
4. How is PSNP intervention implemented in your kebele/woreda?
5. How was food security status and asset building of PSNP beneficiary households before and after participation?
6. How is the PSNP community asset development in the rural kebele /Woreda following program intervention?
7. Do you believe the PSNP brought positive impact for beneficiary HHs on food security and asset building?
8. What do you suggest about PSNP implementation for better improvement in HHs food security and asset building in your kebele/Woreda?

you for your time!