

UNIVERSITY OF GONDAR



***COLLEGE OF AGRICULTURE AND RURAL
TRANSFORMATION***

DEPARTMENT OF AGRICULTURAL ECONOMICS

***THE IMPACTS OF PRODUCTIVE SAFETY NET PROGRAMME ON THE
LIVELIHOOD SECURITY OF RURAL HOUSEHOLDS:***

***THE CASE OF LIBOKEMKEM WOREDA, SOUTH GONDAR ZONE,
ETHIOPIA***

MSC THESIS RESEARCH

By:-

TSEGAYE DENBERIE TESFAYE

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ETHIOPIA***

**A Thesis Submitted to Collage of Agriculture and Rural Transformation
Department of Agricultural Economics in Partial Fulfillment of the
Requirements for Degree of Master of Science in Agricultural Economics**

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As thesis research advisors, we hereby certify that we have read and evaluated this thesis prepared under our guidance by Tsegaye Denberie Tesfaye “The Impacts of Productive safety net program on livelihood security of rural households: The case of Libokemkem woreda, South Gondar Zone, Ethiopia”. The PSM Estimator model Approach: We recommend that it be submitted as fulfilling the thesis requirement.

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Date

DEDICATION

This thesis work is dedicated to my wife Hiwot Bayu, my sister Sefinesh, my mother Shashitu Getaneh and my father Denberie Tesfaye who lost his life at the beginning of my study , for their unconditional and unbounded love, patience and strength that helped me to complete this work.

STATEMENT OF AUTHOR

I declare that this thesis is my own work and that all sources of materials used for this thesis have been duly acknowledged. This thesis has been submitted in partial fulfillment of the requirements for M.Sc. degree at the University of Gondar and is deposited at the University Library to be made available to borrowers under rules of the library. I solemnly 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 in May 1990 in South Gondar zone, Debretabour town. He attended his elementary school education at Kimir Dingay town and his secondary school education in Debretabour town Senior Secondary School. Then he joined the Haramay University in 2008 and graduated in July 2010 with Bsc degree in Agribusiness management. Soon after graduation, he has been working for five years in Addis Zemen town in various capacities. Then after, he joined the school of graduate studies at University of Gondar in October 2014 to pursue his M.Sc degree in Agricultural Economics.

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LIST OF ACRONYMS AND ABBREVIATIONS

ANRS	Amhara National Regional State
ADLI	Agricultural Development Led Industrialization
CSA	Central Statistics Authority
DAs	Development Agents
DPRD	Development Planning and Research Department
FDRE	Federal Democratic Republic of Ethiopia
FSS	Food Security Strategy
GoE	Government of Ethiopia
GTP	Growth and Transformation plan
HH	Household
KA	Kebele Administration
MoA	Ministry of Agriculture
MoFED	Ministry of Finance and Economic Development
OFSP	Other Food Security Program
PRSP	Poverty Reduction Strategy Program
PSM:	Propensity Score Matching
PSNP	Productive Safety Net Program
PIM	Program Implementation Manual
TLU	Tropical Livestock Unit
USAID	United States Agency for International Development
USDA	United states of Department of Agriculture.
WB	World Bank
WADO	Woreda Agricultural Development Office
WFP	World Food Program

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**IMPACT OF PRODUCTIVE SAFETY NET PROGRAM ON THE LIVELIHOOD
SECURITY
OF RURAL HOUSEHOLDS: THE CASE OF LIBO KEMKEM WOREDA OF AMHARA
REGIONAL STATE, ETHIOPIA**

ABSTRACT

This study evaluated the impact of productive safety net program on the livelihood of rural households of Libo Kemkem woreda. Towards this end, data were collected from 210 randomly selected households of which 119 were program participants and 91 were non-program participant's selected from four Kebeles of the woreda, where the productive safety net program was implemented.

Data were analyzed using descriptive statistics and econometric analysis. Results from descriptive statistics revealed that among program participants and non participants, the total annual income has increased averagely by 14467.2 birr and 11469.2 birr. The average livestock holding was 3.7230 TLU and 1.4878 TLU for participant and non-participant households, respectively. Thus, the program enables them to through avoidance of forced disposal in response to shock (increase) their livestock holdings.

Applying a propensity score matching technique, it was found that the program has significantly increased participating households' total income by 59.1%, livestock asset by 14.09% and consumption expenditure by 22.61% compared to non-participating households.

The estimated results also revealed that, households in the program has better access to credit, small land size and better access on agricultural extension, access to aid and less access to irrigation. Finally, physical and biological conservation measures should be widely incorporated, access to extension service for the utilization of new technologies and for policy concern. Generally both households increase their livelihood activities respectively interms of livelihood.

Key words: *Productive safety net, impact, livelihood, propensity score matching, Ethiopia.*

1. INTRODUCTION

1.1. Background of the Study

Over the past decade, Ethiopia has experienced significant economic growth and progress towards Millennium Development Goals (MDGs). Ethiopia's annual GDP growth averaged 10.3% between 2004 and 2012, a period that also corresponded to an impressive decrease in poverty rates: in 2004, 38.9% of the population lived below the national poverty line (\$0.60 per day); in 2012, this figure was down to 29.6%, (Growth and Transformation Plan, (2010 – 2014).

In the past few years the GDP growth composition by sector shifts from agriculture to other sectors, in 2012 agriculture contributes 46.6%, industry 14.6% and services sector contributes 38.8% of the GDP growth (MoFED, 2012).

However, this impressive growth has been accompanied by inflation pressure, rain fall dependence, natural hazard, which are the main driving force that affects millions of Ethiopian people,(DPRD and MoFED, 2012). Yet much of Ethiopia's economy depends on agriculture, which is conditioned by adequate and reliable rainfall. Over the year, scanty and erratic rainfall has led to significant drought and subsequent famine. Every year five million people exposed to chronic and transitory (seasonal) food insecurity in particular to rural area (WFP, 2011).

According to DPRD and MoFED (2012), poverty remains widespread in Ethiopia. Using a consumption-based measure of poverty, 38.7 percent of Ethiopians were poor in 2009/2010, implying that 29.2 million people were living below the poverty line. Poverty is slightly higher in rural areas (39.3 percent) than it is in urban areas (35.1 percent).

The government of Ethiopia's current Growth and Transformation Plan (GTP) aims to enhance productivity and production of smallholder farmers and pastoralists; strengthen marketing systems; improve participation and engagement in livelihood pathways; and reduce the number of chronically food insecure households. Spending on "pro-poor" sectors (health, education, agriculture and natural resources, and rural roads and urban construction) has increased from 52% of general government expenditure in FY 2003 to 70% in FY 2011/12 (MOFED, 2012).

The launch of the PSNP in 2005 represented a pivotal departure from the cycle of annual emergency food aid appeals. Following the drought of 2002/2003, the Government of Ethiopia formed the New Coalition for Food Security to identify key actions to break the cycle of emergency appeals—which saved lives but did little to protect household assets—and comprehensively address food insecurity in Ethiopia. This process resulted in the creation of the Food Security Programme (FSP). Launched in 2003, the FSP was funded by the government of Ethiopia and development Partners and implemented, mostly through government structures, in Amhara, Oromiya, Tigray and Southern Nations, Nationalities and Peoples Region (SNNP), with Harari and Dire Dawa added in 2005. During these first two phases (2005-2009), the FSP comprised three complementary components: the Productive Safety Net Program, the Other Food Security Program, and the Land Access Programme (resettlement).

Amhara Regional State is one of the beneficiary regions in the country. This Service was also initiated with the objective of improving the livelihoods of chronically food insecure households in the PSNP target Woredas through diversifying livelihood options. Therefore, out of 167 rural woredas in the region, the program has been implementing in 64 chronically food insecure weredas (PIM, 2015).

Therefore, the program aimed to help the poor and the vulnerable in coping with the negative impact of the recurrent drought in the study area. This study evaluates the performance of the productive safety net program on the dynamics of household livelihood in the rural kebeles of the woreda beneficiaries.

In this study, improvement in the livelihoods of rural households is assessed by examining the impact of household participation in the program. Household participation is expected to improve household income, consumption and asset holdings, which are used in this study as indicators of the outcomes of the program.

Moreover, the Program is designed to protect household assets and ensure a minimum level of food Consumption. It is also designed to encourage households to increase incomes generated from agricultural activities and to build up assets.

1.2. Statement of the Problem

The interest in developing a safety net program in Ethiopia grows out of the fact that the emergency system in Ethiopia was failing to stabilize livelihoods. Lives were being saved but, livelihoods continued to erode. As a consequence, more and more people were in need, resulting in an overwhelming humanitarian caseload. Each emergency resulted in further asset loss and destitution. As the population lost productive assets and became less able to cope, minor events had the impact of major shocks (SC-UK, 2008). Both government and donors became convinced of the need to this program. For donors, increased interest in budget support mechanisms as well as growing support for social protection also played a part. For the government, concern that the emergency response system was encouraging dependency syndrome and unease about Ethiopia's image as a 'basket case' were strong incentives (SC-UK, 2008).

In Amhara region in general, and in Libo Kemkem woreda in particular, smallholder farmers are characterized by subsistence production and suffered from complex and interrelated socio-economic problems. Shortage of farm land, recurrent drought, and environmental degradation are the most significant problems that challenge the lives of the population (PSNP PIM, 2015). Twenty two kebeles out of the twenty nine kebeles of the woreda are classified as food insecure kebeles. Among others, the regional government has allocated huge amount of resources to protect the rural communities' asset depletion and diversifications of rural income of households. Although efforts have been made to raise agricultural crop yield, the food insecurity problem is still a major challenge in the woreda, in particular. To increase the productivity of land, the office of agriculture has been promoting adoption and diffusion of improved technologies by farmers. In particular, farmers have been advised to adopt several physical soil conservation measures.

The PSNP is a public program through which food-insecure people are employed in public work for five days a month during the agricultural slack seasons. 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 (Anderson et al., 2009).

The program is mainly targeted to help poor farmers who are susceptible to food insecurity about six or more months in a year even though crop failure is not reported. Increasing household asset and preventing asset depletion of the households and community asset building are major points targeted to improve. The proposed study area, Libo Kemkem woreda, is among the 22 woredas identified as chronically food insecure and eligible for the PSNP at the national level.

Despite the fact that the PSNP has been implemented since 2005 in the country to address the problems and shortcomings of the previous practice of assistance that focuses only on saving lives, evaluation of the effects of such programs is not yet given due attention it deserves. But the effectiveness of the program in terms of diversifying livelihood has not been studied in the study area. This study, therefore, attempt to fill this research gap by conducting an empirical study on the impact of the PSNP on farm households' livelihood in rural Kebeles of the woreda beneficiaries.

1.3. Research Questions

The study attempted to address the following research questions:

- What are the factors influencing rural households' participation in the PSNP?
- What impacts do the PSNP schemes have on the livelihood (income, livestock holding and consumption) of households in the study area of the beneficiaries?

1.4. Objectives

The general objective of this research is to analyze the impacts of productive safety net program on the livelihood of rural households in Libo Kemkem woreda.

The specific objectives of the research are:

- a) To identify factors affecting household's participation in the productive safety net program.
- b) To examine the impact of the PSNP on livelihood of rural beneficiary households.

1.5. Significance of the study

The study contributes to awareness of the impact of PSNP on rural livelihoods and its success in achieving its goals. In other words, it was hoped that this study contributes to the understanding of the impact of PSNP for different stakeholders as well as for anyone who want to use it. In addition, it informs some realities both to the community and policy makers and implementers how to achieve success in livelihoods. Furthermore, the study serve as a bridge for other studies in the future on same and other related issue. The analysis carried out through a comparative assessment of program outcomes of participant households with outcomes of non-participant households. It is also essential for community based organizations working in the study area and other areas with similar socioeconomic settings.

1.6. Scope and Limitations of the Study

Even though the concern of the study, that is productive safety net program is the largest social protection program operating in sub-Saharan Africa, this study is only limited to assessing its impacts on livelihood in four selected rural Kebeles of the woreda. Despite such limited scope, results of the study provide insights into how the program is contributing to its major objectives.

Methodologically, the study uses PSM to assess the impact of PSNP on the rural livelihoods. In doing so, it uses data from non-program participants in order to compare some outcome variables with the result of program participants. However, it can be difficult to find a comparison group (and often an observable) determination and ability that lead the households to join the program. Therefore, the study was undertaken to meet its objectives within the limitations mentioned.

1.7. Organization of the Thesis

The thesis is organized into five chapters. Following this introduction part of the study, the remaining chapters are organized as follows. The second chapter presents review of relevant literature. The third chapter deals with the research methodology. The fourth chapter presents results and discussion. Finally, the fifth chapter presents the conclusion and recommendations of the study.

2. LITERATURE REVIEW

2.1 Introduction

This chapter presents key concepts, theoretical explanations and research findings related to this research. This chapter emphasis on the concepts of productive safety net program, rural livelihood and the existing policies strategies of PSNP, about concepts and approaches of impact evaluation and it also presents empirical studies on the impacts of PSNP on rural livelihood.

2.2 Theoretical Literature Review

Different Economists proposed several theories of investment over different time periods. Therefore, this section reveals definitions and concepts of PSNP and some of the very prominent theoretical literatures on PSNP, rural livelihood and existing policies, strategies and guidelines on PSNP.

2.2.1 Definitions and Concepts of PSNP and livelihood

The Productive safety net program (PSNP) aims to reduce the number of people who rely on annual humanitarian appeals, by providing predictable and timely cash and food (PSNP-PIM, 2015). 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.

Households (HHs): CSA defines household as a collection of a persons who normally live together in the same unit or group of housing units and who have common cooking arrangement. The household is the basic unit of analysis in many social, microeconomic and government models. The term refers to all individuals who live in the same dwelling. In economics, a household is a person or a group of people living in the same residence. (CSA, 2012)

Graduations: from the PSNP is defined as a households being able to feed itself for 12 months a year, in the absence of program support, as well as being able to withstand modest shocks (PSNP-PIM, 2010).

Livelihood: The concept of livelihood is widely used in contemporary writings on poverty and rural development, but its meaning can often appear elusive either due to vagueness or to different definitions being encountered in different sources (Ellis and Tengberg, 2000). Moreover, a recent review of livelihoods approaches shows that definitions are far from uniform and prescriptive but are instead constantly evolving and developing. This allows for imaginative adaptations to be made as required, but also renders the concept and use of a livelihoods approach rather difficult to grasp (FAO, 2001). A popular definition is that provided by (Chambers and Conway, 1992) where a livelihood comprises the capabilities, assets (including both material and social assets) and activities required for a means of living. Briefly, one could describe a livelihood as a combination of the resources used and the activities undertaken in order to live (DFID, 1999)

Household livelihood security: Household livelihood security is defined as adequate and sustainable access to income and resources to meet basic needs (including adequate access to food, potable water, health facilities, educational opportunities, housing, time for community participation and social integration). Livelihoods can be made up of a range of on-farm and off-farm activities which together provide a variety of procurement strategies for food and cash. Thus, each household can have several possible sources of entitlement which constitute its livelihood. These entitlements are based on the household's endowments and its position in the legal, political and social fabric of society (Drinkwater and McEwen, 1992). The risk of livelihood failure determines the level of vulnerability of a household to income, food, health and nutritional insecurity. Therefore, livelihoods are secure when households have secure ownership of, or access to, resources and income earning activities, including reserves and assets, to offset risks, ease shocks and meet contingencies (Chambers, 1989).

A livelihood is sustainable, according to Chambers and Conway (1992), when it "can cope with and recover from the stress and shocks, maintain its capability and assets, and provide sustainable livelihood opportunities for the next generation..." Unfortunately, not all households are equal in their ability to cope with stress and repeated shocks. Poor people balance competing needs for asset preservation, income generation and present and future food supplies in complex ways (Maxwell and Smith, 1992). People may go hungry up to a point to meet another objective. For example, (De Waal 1989) found that during the 1984/85 famine in Darfur, the Sudan, and

people chose to go hungry to preserve their assets and future livelihoods. People will tolerate a considerable degree of hunger to preserve seeds for planting, to cultivate their own fields or to avoid selling animals.(Corbett 1988), in exploring the sequential ordering of behavioral responses employed in periods of stress, found that in a number of African and Asian countries preservation of assets takes priority over meeting immediate food needs until the point of destitution. Thus, food and nutritional security are subsets of livelihood security; food needs are not necessarily more important than other basic needs or aspects of subsistence and survival with in households. Food-insecure households juggle among a range of requirements, including immediate consumption and future capacity to produce.

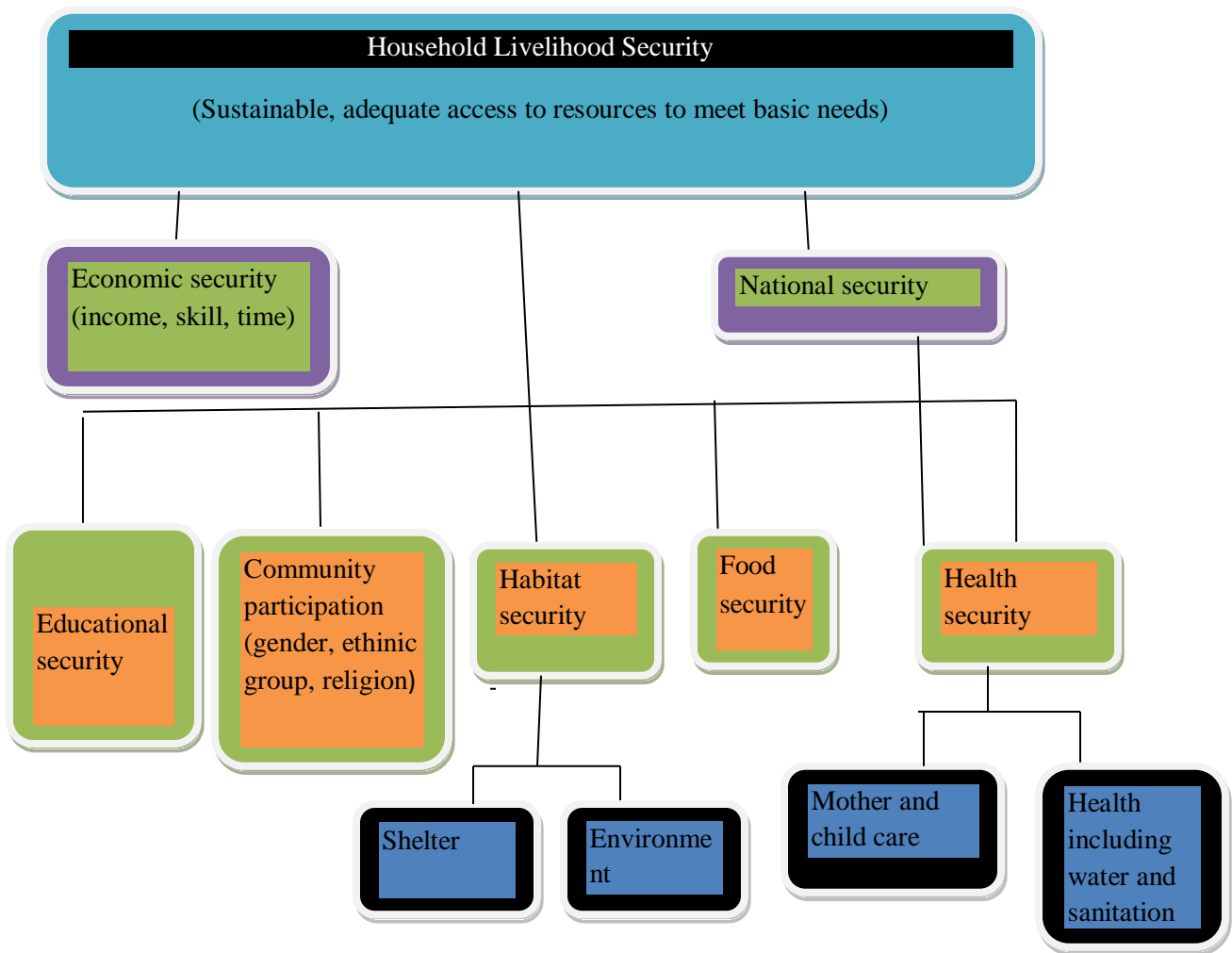


Figure 1: Components of household livelihood security

Source: CARE USA (2012)

2.2.2. PSNP in Ethiopia

The overall objective of the program is “Food security for those who are able, and food sufficiency for those unable to achieve food security, for male and female members of chronically food insecure households in chronically food insecure areas achieved”. The Productive safety net program classified Food insecurity as chronic or transitory. Some other literatures also include cyclical type of food insecurity as a third kind of food insecurity.

Chronic food insecurity: Chronic (permanent) food insecurity is a continuously inadequate diet resulting from lack of resources to produce or acquire food, or 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. Structural factors contributing to chronic food insecurity include poverty (as both cause and consequence), the fragile natural resource base, weak institutions and unhelpful or inconsistent government policies. It is argued that chronic food insecurity at the household level is mainly a problem of poor households in most parts of the world (FAO, 2002).

On the other hand, **transitory food insecurity** □ transitory food insecurity is a temporary decline in the household to access enough food (World Bank, 1986; Reutlingen, 1987). When a shock has depleted the food stores and current incomes streams of household to the point that they are unable to meet their immediate food needs, these households are described as transitory food insecure. It results from a temporary decline in household access to food due to crop failure, seasonal scarcities, temporary illness or unemployment, instability in food prices, production, household income or combination of these factors. But, the main triggers of transitory food insecurity in Ethiopia are drought and war. Finally, the cyclical type of food insecurity is caused by seasonality (Osmani 2001, FAO 2006). The PSNP includes measures to protect against transitory food insecurity, and transitory food insecurity is the focus of the emergency relief system.

In general, a household said to be food secure only if it has protection against all kinds of insecurity. The average access to food over the long term should be nutritionally adequate, and a

household should be able to cope with short-term vicissitudes (changes) without sacrificing the nutritional needs of any of its members. Finally the concept and definition of food security were developed and clearly explained based on the growing hunger, food insecurity and malnutrition situations in developing countries. From the definitions of food security, slight variations were observed. However, the overall basic principles and definitions of food security, that is, “availability, access and utilization” were stressed in the definitions cited above. Therefore, for the purpose of this study, the definition put forward by World Food Summit (1996) was taken as a working definition of food security and the household level is considered as the key unit of food security analysis.

2.2.3. Indicators of sustainable livelihoods

There are five key elements that can be recognized, each relating to a wider literature with, established ways of evaluating outcomes. Linking concerns over work and employment with poverty reduction with broader issues of adequacy, security, well-being and capability elements focus on livelihoods. And Livelihood adaptation, vulnerability and resilience, and Natural resource base sustainability elements add the sustainability dimension (Ian Scoones).

A. Creation of working days: This relates to the ability of a particular combination of livelihood strategies to create gainful employment for a certain portion of the year. This may be on or off-farm, part of a wage labour system or subsistence production. Sen (1975: 5) notes three aspects of employment – income (a wage for the employed), production (employment providing a consumable output) and recognition (where employment provides recognition for being engaged in something worthwhile). In terms of the income/production aspects, various target levels have been suggested, but 200 days a year appears to be widely used as a minimum level to create a livelihood (Lipton 1991; 1993). Overall, the number of livelihoods created will be dependent on the proportion of the population available for work.

B. Poverty reduction – The poverty level is a key criterion in the assessment of livelihoods. Various measures can be used to develop an absolute ‘poverty line’ measure based on income or consumption levels (Ravallion 1992; Baulch 1996). Alternatively, relative poverty and inequality

can be assessed using Gini coefficient measures. There are a range of pros and cons for each measure, as well as some major measurement challenges (Greeley 1994). However, such quantitative assessments of poverty can be used in combination with more qualitative indicators of livelihoods (Jodha, 1988; Schaffer 1996).

C. Well-being and capabilities – The notions of ‘well-being’ (cf. Chambers 1995; 1997) and ‘capability’ (Sen 1984; 1987) provide a wider definitional scope for the livelihoods concept. Sen sees capabilities as ‘what people can do or be with their entitlements’, a concept which encompasses far more than the material concerns of food intake or income. Such ideas represent more than the human capital which allows people to do things, but also the intrinsically valued elements of ‘capability’ or ‘well-being’. Chambers (1997) argues that such a well-being approach to poverty and livelihood analysis may allow people themselves to define the criteria which are important. This may result in a range of sustainable livelihood outcome criteria, including diverse factors such as self-esteem, security, happiness, stress, vulnerability, power, exclusion, as well as more conventionally measured material concerns (Chambers 1989).

D. Livelihood adaptation, vulnerability and resilience – The ability of a livelihood to be able to cope with and recover from stresses and shocks is central to the definition of sustainable livelihoods. Such resilience in the face of stresses and shocks is a key to both livelihood adaptation and coping (Davies, 1996). Those who are unable to cope (temporary adjustments in the face of change) or adapt (longer term shifts in livelihood strategies) are inevitably vulnerable and unlikely to achieve sustainable livelihoods. Assessing resilience and the ability to positively adapt or successfully cope requires an analysis of a range of factors, including an evaluation of historical experiences of responses to various shocks and stresses. Different types of shock or stress, in turn, may result in different responses, including avoidance, repartitioning, resistance or tolerance mechanisms (Payne and Lipton 1994: 15).

2.2.4. PSNP and risk management

The PSNP provides cash or food to people who have predictable food needs in a way that enables them to improve their own livelihoods and manage risks today; and therefore become

more resilient to the effects of shocks in the future. Independent studies have shown that the PSNP has reversed the pre-2005 trend of decade-on-decade deterioration in livelihoods. The PSNP has shown that providing timely and predictable assistance enables households to manage risk more effectively by preventing costly coping strategies such as sale of vital assets that worsens future food insecurity. The PSNP both protects households from food insecurity and allows them to use their resources more flexibly to smooth out consumption.

However, while the PSNP responds to the chronic food insecurity of households, there are times when a shock results in some households whether within the PSNP or not - facing transitory food insecurity and requiring additional temporary support. In these instances, the PSNP has dedicated Contingency Budgets, designed to meet transitory needs. However, if a shock is too large, the PSNP's contingency funds can be exhausted before all the transitory needs are met. When the contingency funds are exhausted, the Risk Financing Mechanism (RFM) is designed to address these needs. The RFM is an instrument that allows the PSNP to scale up in times of transitory crisis, in those districts where it is already operational. In particular, the RFM was designed to reduce the 'typical' humanitarian timeline for response, so that households would receive assistance before the crisis was felt. In this way, the PSNP can expand and respond as the situation requires. The program can address predictable food needs through usual PSNP operations, can address low-level transitory needs caused by moderate shocks through contingency funds and can address higher levels of transitory needs through the RFM.

According to World Bank, (2013) report, in order for the RFM to function correctly, four conditions need to be fulfilled. These are: Effective early warning systems need to be in place to indicate the need for a response as early as possible (Early Warning); Plans need to be put in place so that when a shock is indicated, key actors know how to respond (Contingency Plans); Resources need to be available to avoid the major time delays associated with the humanitarian appeal process (Contingency Financing) and Institutional arrangements and capacity need to be in place to allow plans to be implemented (Institutions and capacity).

By putting in place effective early warning systems, contingency financing, contingency plans

and institutional capacity ahead of the crisis, the ‘typical’ timeline for humanitarian response can be significantly reduced, from 8-9 months to 2 months, as was the case in 2011, when the Horn of Africa was affected by the largest drought in 60 years. In August 2011, Ethiopia used RFM to address the transitory food needs of approx. 9.6 million drought-affected people (World Bank, 2013).

Addressing transitory food insecurity in addition to chronic food insecurity is integral to the transition from relief to development in Ethiopia. With increased vulnerability as a result of climate change, the capacity of communities and Government to manage risks – already being built by the PSNP is becoming increasingly important.

2.3. The Empirical Studies of the Impact of PSNP

There are some empirical studies that have been conducted by different researchers to assess the Impact of PSNP in Ethiopia. Among these studies some of the works tried to assess the impact of the program one year after the onset of the program using cross sectional data - examples include Devereux *et al.* (2006) and Gilligan *et al.* (2008). But according to Devereux *et al.* (2006), since impact might not accrue in the short run, to fully and rigorously evaluate the PSNP, longitudinal Data is needed. Even though some literature did a panel data analysis they did not focus on welfare (poverty), for instance Anderson *et al.* (2009) and other authors such as Wheelers and Devereux (2010) examined only a change in beneficiary’s status in time without taking the counterfactual situation.

According to Yibrah (2010) who analyzed the impact of PSNP on rural household’s asset protection and consumption using PSM technique, Productive Safety Net Program intervention enables beneficiary households to retain their assets holdings. The asset values of the PSNP beneficiary households have exceeded that of the non-PSNP beneficiary households. The PSNP beneficiary households, as a result of PSNP intervention, have increased their livestock holdings. Thus, the program enables them to protect (increase) their livestock holdings. The result of this study found that the mean difference of the livestock holdings, in terms of TLU, between the PSNP beneficiary households and the non-PSNP beneficiary households was positive and significant. Therefore, this study will be conducted to evaluate the impact of PSNP

on food security, property possession, annual income and consumption expenditure of households' using propensity score matching technique.

Andersson *et al.* (2009) analyzed the impact of PSNP on livestock and tree holding of rural household in Ethiopia. The study found that there was no indication of participation in PSNP leads households to disinvest in livestock or tree. In fact, the number of trees increased for households that participated in the program. It could be the case that participation in PSNP (where tree planting and subsequent forest management work on public lands are usual activities) leads to households becoming more skilled in forestry, and that they switch to increased forest planting as a result.

Nonetheless, per the impact evaluation conducted by International Food Policy Research Institute (IFPRI) in 2009 in 68 PSNP Woredas in Tigray, Amhara, Oromia and SNNP regions using a longitudinal (panel) household and community data collected and matching methods, participation in the public works component of the PSNP (defined as receipt of at least 100 birr in payments over the first five months of 2006, 2007, and 2008) has modest effects. It improves food security by 0.40 months and increases growth in livestock holdings by 0.28 Tropical Livestock Units (TLU). Relative to non-beneficiaries, beneficiary households perceive that their welfare has improved (Gilligan *et al.*, 2009).

2.3.1. The Social and Economic Impacts of PSNP in Africa

Different studies have been carried out on the impacts of the social safety net and transfer issues in different countries of Africa. Some of them are Devereux, (2002) assessed the cash transfers intervention in Namibia (social pensions), public works in Zambia, and Mozambique (cash payments to urban destitute). According to this study, the program had identified different poverty and other economic and social outcomes of these income transfers.

Miller *et al.*, 2010, in Malawi, employed both descriptive and econometric techniques of difference-in-differences estimates to analyze the impact of cash transfer on household food security. The results from his study show that intervention households in Malawi allocated 62%

of total expenditures to food purchases and the recipients were able to reach what they reported as an acceptable level of food security.

2.3.2 Social and Economic Impacts of PSNP in Ethiopia

In Ethiopia, the PSNP is already having a significant impact and there is clear evidence that several important changes have taken place in terms of nutrition, attitudes, and risk-taking behaviors', particularly in terms of food consumption, asset protection, asset building, and allowing people to feel secure enough in their income to take productive loans which they previously found too risky (Rachel S., Steve Ashley and Mulugeta T, 2006).

Graduation processes are complex and cannot simply be delivered through a safety net programme alone. Although public work is meant to prevent dependency on the PSNP, findings suggest that it may in fact do the opposite for households with higher numbers of non-workers such as children, people with disabilities and the elderly. The labour requirements of the PSNP draw labour away from households' own livelihood activities and affect their choice of packages. There is a danger that households become more, not less, dependent on the PSNP because the work requirement reduces their ability to pursue successful alternative livelihood activities.

This suggests that PSNP, especially when transfers are issued as cash, is helping households achieve their wider objectives in terms of investments in human capital (www.wahenga.net lessons from Ethiopia on a scaled-up national safety net programme).

2.4. Impact Assessment Methods

Impact assessment of a designed programme intervention is to show the effect of the programme on participating group and comparator group that did not participate in the programme as a control group, but having similar pre-intervention socio-economic characteristics. Thus, estimating the impact of a programme requires separating its effect from intervening factors which may be correlated with the outcomes, but not caused by the programme (Ravallion, 2005). Impact evaluation of a given intervention programme is intended to determine more broadly whether the programme had desired effects on individual households, organizations,

institutions and others as per the programme intervention design. The impact may result in positive or negative effect on beneficiaries (Baker, 1960). Generally there are three impact evaluation methods in estimating treatment group participants and control groups. These are randomization/or experimental design, non-experimental design and quasi-experimental design. Depending on the data availability, ethics to experiment and costs, social science methods deals with randomization/or experimental, non-experimental and quasi-experimental methods (Jalan and Ravallion, 2003).

2.4.1. Experimental evaluation method

Social experiments are intended to analyze policy issues how things react to a type of policy that has never been tried and one which has no available data observed. The concept of social experiment is to assess a group of willing participants, some of whom are randomly assigned to a treatment group and the rest to a control group. The term experimental refers to the group receiving treatments, control refers the group no receiving treatment and random assignment of individuals in to two groups (Colin and Pravin, 2005).

The contribution of the treatment to the outcome difference between the treated and control group can be estimated without confounding bias in the cause where one cannot control for the confounding variables. However, an outcome depends on treatment as well as other observable factors, so controlling for the latter will in general improve the precision of the impact estimate. A random assignment of households to treatment and non-treatment groups ensures that on average any difference in outcomes of the two groups after intervention can be attributed to the intervention. In randomized experiment the problem of selection bias can be avoided as a best way of assignment in which the participation characteristics is unmeasured or unobserved. In such causes randomization takes place before the program begins (Ezemenariet *al.*, 1999;Smith and Todd, 2005).

2.4.2. Non-experimental method

A non-experimental method is used when the program participant located intentionally. It can

be used through the access of cross-sectional survey data after the program is introduced. Accordingly there are two broad categories of non-experimental approach, before and after through cross-sectional estimator. Cross-section estimators use non participants to derive the counterfactual for participants (Bryson *et al.*, 2002).

2.4.3. Quasi-experimental method

A quasi-experimental method is the only alternative utilized where there is no baseline survey or randomization is not a feasible option and not takes place prior the intervention. It involves matching programme participants with a comparable group of individuals, who did not participate in the programme after intervention (Jalan and Ravallion, 2003; Dehejia and Wahba,2002).

2.4.4. Methodologies to construct counterfactual groups

Non experimental methods sometimes are also called statistical methods use statistical techniques to simulate the counterfactual, i.e., the outcome that would have prevailed had there been no intervention. The most frequently used non experimental methods available for evaluating development programs include propensity score matching (PSM), difference in differences (DD), regression discontinuity design (RDD), and instrumental variables (IV).

a) Propensity Score Matching

The basic idea of the propensity score matching method is to match program participants with non participants typically using individual observable characteristics. Each program participant is paired with a small group of non participants in the comparison group that are most similar in the probability of participating in the program. This probability (called propensity score) is estimated as a function of individual characteristics typically using a statistical model such as logit or probit model. The mean outcomes of these groups of matched non participants form the constructed counterfactual outcome. The mean program impact is estimated by the difference between the observed mean outcome of the project participants and the mean outcome of the constructed counterfactual (Caliendo et al., 2005).

b) Double difference in difference

The difference in difference (or double difference) method entails comparing observed changes in and non participants using a baseline survey before the program. One then repeats this outcome before and after the project for a sample of participants and nonparticipants. Typically, one collects outcome data of both participants survey at some later point(s) after the program is implemented. This repeat survey(s) should be highly comparable with the baseline survey in terms of the questionnaire, the interview, etc. The mean program impact is estimated by comparing the mean difference in outcomes “after” and “before” the intervention between the participant and non participant groups. The underlying assumption of DD method is that project participants would have the same outcomes as individuals in the comparison group in the absence of the project. Since this is highly unlikely in reality, PSM is a natural choice to select a comparison group before calculating the differences in a DD method. For this reason, the PSM and DD methods are often used together in practice (Baker, 2000).

c) Regression discontinuity

The regression discontinuity design method can be used when program participation is determined by an explicitly specified exogenous rule. The method stems from the intuition that individuals around the cut-off point for eligibility are similar and uses individuals just on the other side of the cut-off point as the counterfactual. In other words, RDD compares outcomes of a group of individuals just above the cut-off point for eligibility with a group of individuals just below it. The major technical problem of the RDD method is that it assesses the marginal impact of the program only around the cut-off point for eligibility, and nothing can be said of individuals far away from it. In addition, for the RDD estimate to be valid a threshold has to be applied in practice and individuals should not be able to manipulate the selection score to become eligible (ADB, 2006).

d) Instrument variables

The instrumental variables method works exactly as a standard regression analysis. When the program placement is correlated with participants’ characteristics, then the estimate of program effect using an ordinary least squares regression model is biased. To correct this, one needs to replace the variable characterizing the program placement with another variable(called

instrument) such that it mimics the variable being replaced (i.e., correlated with the program placement) but is not directly correlated with the program outcome of interest (Felici, 2008).

2.4.5. Why PSM Method for the Study?

This method is chosen for this study because now a day's PSM is popular method for program evaluation studies in many applications of interest due to the dimensionality of the observable characteristics is high. This matching method tries to pick an ideal comparison matching based on propensity score in which comparison group is matched with the treatment group on the basis of a set of observed characteristics or by using predicted probability of participation given observed characteristics the closer the propensity score, the better the match (Ravallion, 2003).

The PSM method is very useful if there are many potential characteristics to match between a sample of treated individuals and a sample of non-treated individuals. The treatment impact is then the difference in outcomes between the treatment and comparison group (Heckman and Todd, 1997). The PSM method provides a natural weighting scheme that yields unbiased estimates of the treatment. The weights are formed as the inverse of the predicted probability that an individual would make the choice to participate in the treatment. The resulting predicted probabilities are used to create weights that are used in subsequent analyses (Baker, 2000). While computing the estimated treatment effect, different matching techniques provide different weights on comparison units. The most frequently estimated parameter for such studies is the average treatment effect on the treated (ATT) which is the difference between expected outcome with and without treatment for those who have actually participated in treatment (Caliendo and Kopeinig, 2008).

PSM neither requires randomization nor pre-intervention data but in practice pre intervention data is used to control for differences in individual characteristics prior to implementation of a given program (This is required if a combination of PSM and DID methods is applied). A second best is to use it in the post-intervention data only (Felici et al., 2008). Unlike econometric regression methods, it does not rely on parametric assumptions to identify the impacts of program and it does not impose a functional form of the outcome thereby avoiding assumptions on functional form and error term distributions (Rajeeve, et al., 2002). Besides, PSM compares

outcome for observation, who share similar observable characteristics using matching methods. This matching method emphasizes the problem of common support thereby avoiding the bias due to extrapolation to non-data region. Results from the matching method are easy to explain to policy makers since the idea of comparison of similar group is quite intuitive. PSM requires large amounts of data both on the universe of variables that could potentially confound the relationship between outcome and intervention, and large numbers of observations to maximize efficiency. Irrespective of its shortcomings, PSM is extensively used in the recent literature (Ravallion, 2005).

2.4.6. Steps in Application of PSM Method

In the estimation of average treatment effect on treated (ATT) using propensity score matching method first the propensity score is estimated using a logit model with maximum likelihood method to estimate the participation probability, a logit model is often preferred due to the consistency of parameter estimation associated with the assumption that error term u in the equation has a logistic distribution (Caliendo and Kopeinig, 2008). Matching estimator is selected based on the data at hand after undertaking matching quality test, overlapping condition or common support condition is identified, the treatment effect is estimated based on the matching estimator selected on the common support region. Finally, sensitivity analysis is undertaken to check the strength of the conditional independence assumption identified. Sensitivity analysis can also be undertaken to check if the influence of an unmeasured variable on the selection process is so strong to undermine the matching procedure.

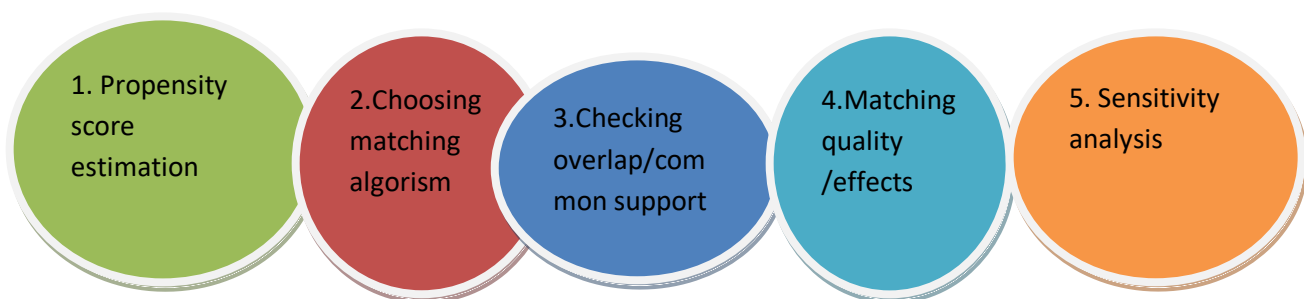


Figure 2: PSM-implementation steps

Source: Caliendo and Kopeinig, 2005

3. RESEARCH METHODOLOGY

This chapter describes the overall methodology of the research thesis. This part is divided into four sections. In the first section, the proposed area is described briefly. The second section describes about the productive safety net program in the proposed area. The third section provides information on the sources and methods of data collection while the final section discusses the methods of data analysis.

3.1. Description of the study area

The study has been conducted in Libo Kemkem woreda, South Gondar Zone of Amhara National Regional State, Ethiopia with the distance of 62 km, 80 km, and 85 km from Debre Tabor, Bahir Dar and Gondar respectively. It coordinates at 11⁰57'-12⁰20'N latitude and 37⁰25'-37⁰58'E longitude and it is bordered on the North Belesa woreda, on the south Fogera woreda, on the west Gonder zuria woreda, on the east Ebnat woreda.

It is located at the northern limit of the central highlands of Ethiopia. The landform (altitude) is complex composed of highlands (in the range of 1800 up to 2850 meters above sea level. Topographically, the woreda is characterized by rugged features, plain/flat, mountainous, and undulated which constitute 27%, 35%, 20% and 18% respectively. The land slope of the area is generally undulating to flat land; 50% and 50 % slope (MoWR, 2012).

3.1.1. Climate and agro ecology

Libo kemkem woreda has diversified agro-ecological zones and niches each with distinct soil, geology, vegetation cover and other natural resources. The climate is generally tipped moist mid highland and tipped sub moist mid highland, with the average annual rainfall amount of 900-1400 mm. Most of this rain is received during mid June to September. The rainfall pattern is predominantly uni-modal. Agro-ecologically the climate is in the woyna dega with the largest coverage 78% and dega covers 22%. Its average temperature is 11.1-27.9°C (MoWR., 2009).

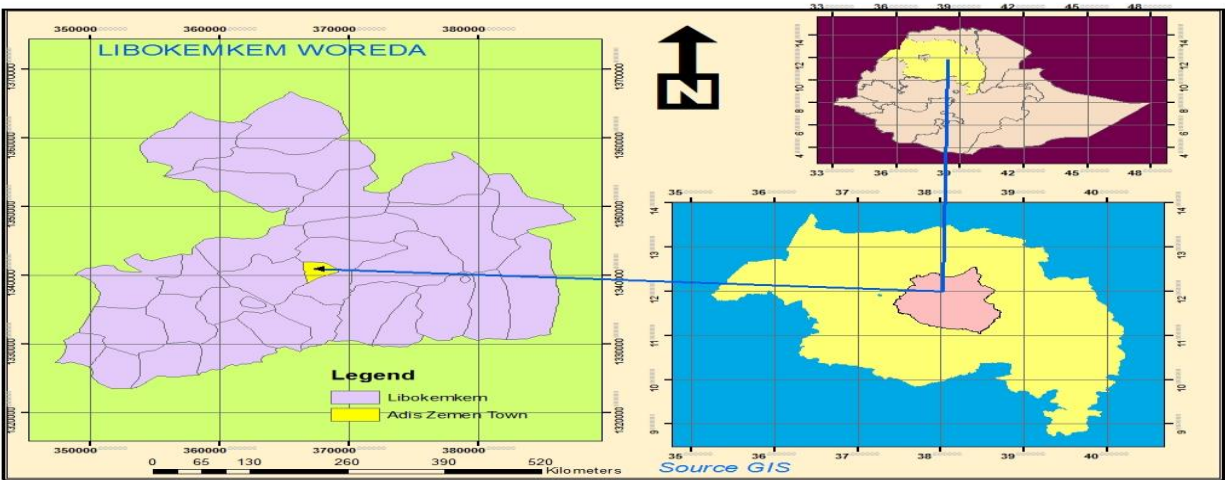


Figure 3. Map of the study area

3.1.2. Land use and Farming system

According to the woreda Environmental protection, land administration and use office annual report, the total area of the woreda is estimated to be 108,157 hectares. The proportion of areas under cultivation, grazing land forest and housing construction is indicated under Table1. Those areas that are covered by bush, shrubs and natural forest are found in the mid-altitude areas and specifically of around the church. (WEPLAUO annual report, 2012).

Table 1. Land use in Libo kemkem woreda

No	Land use	Area /hectares/	Percent (%)
1	Total area	108,157	100
2	Cultivated land	34933	32.3
3	Grazing land	8947	8.27
4	Forest	4391	4.1
5	Water body	38366	35.49
6	Bush and shrubs	5937	5.5
7	Construction & other services	4692	4
8	Others	11191	10.34

Source: WEPLAUO annual report (2012)

The farming system of the woreda is characterized by crop-livestock mixed farming systems. Average land holding in this area is about one hectare/4 *Timad*/ head (WEPLAUO annual report., 2012). Above 85% of people's income is depending on agricultural production. The woreda is partly labeled as one of the food insecure areas in the south Gondar zone. The major food crops grown in the woreda are Teff, Maize, Wheat, Sorghum, Peas, Beans, Rice, Barley, Potato, seed, Onion, and Tomato which are used both as source of food and income and playing a great role in the Life's of the people (WADO, 2012).

3.1.3 Livestock resource

Livestock production is an integral part of the production system. Production of cattle (milk, meat), sheep and goat (meat), asses, horse, beekeeping and poultry is a common practice in the woreda. Cattles are exported to the Sudan and used for local market while sheep, goats are mainly used for the local market. Livestock population of the District is cattle 62,609, goats 68,119, sheep 78,161, donkey 10,909, poultry 14,215 and bee hives 5712. (Livestock department, 2016)

3.1.4. Rural finance

The Amhara Credit and Saving Institution (ACSI) is the major provider of credit and saving service for the rural population. The credit repayment schedule varies from one investment type to the other. ACSI has made an agreement with the ANRS DPFSC office called the food security loan distribution agreement since 2011(2003 E.C) to distribute loan for food insecure households to increase their livelihood. Thus, Libo kemkem woreda ACSI sub-branch office in line of its organization also provides loan based on the agreement taken by the ACSI main office at Bahidar town.

Cooperative at kebele and woreda level is one of the rural finance institutions that provide credit and other services for the rural people as well.

3.1.5. Crop Production

The total area of the woreda is 108,157 hectares. A total of 34,812 hectares are used for crop production including 6,519 hectares of irrigable land. The remaining area is for grazing, forest and bushes, roads and other constructions (WoA, 2012).

3.2. Description of the Productive Safety Net Program in the woreda

The Productive safety net program (PSNP) has been implemented since 2005 in the woreda. Since the PSNP has been implemented in 22 food insecure rural *kebeles* of the 29 total *kebeles* in the study area, the program has three components; livelihood, direct support and public work component. The livelihood component provides training in the areas of marketing, business and value chain activities and preparation of effective business plan for referral to micro financial institutions to get credit. The remaining two components provide cash and grain to PSNP beneficiaries. The amount of payment was ETB 5 in the starting time of the program and has increased to ETB 41 per day per individual since 2016 in the woreda. The selection criteria of beneficiaries in the woreda as confirmed by food security task forces shows that a community selection based on asset ranking, social status (specially the lowest social status based on their wealth rank). (PSNP-PIM, 2010).

The two components except direct support components, households participate in labor intensive activities such as income generating activities, soil and water conservation activities on communal lands, afforestation, fencing and construction of schools, construction of feeder roads, and providing local raw materials for construction. The working schedule is from January to June of each year. The participants work for five days per month for at least 6 hours per day and receive 15 kg/person plus 4kg pulse/person. However, the payment is not only for participating individuals in the household rather multiplied by the number of family members. That is, a participating household receives 15Kg of wheat or a cash multiplied by the number of family member considering children and other disabled family members, but those who are able to work should participate in the public work activities.

The PSNP is supplemented by other food security programs (OFSP) in the woreda. PSNP identification card is usually provided to PSNP beneficiary households. Loan is provided for beneficiary households based on their business plan for different livelihoods/investment packages purposes like animal production, fattening, to purchase agricultural inputs, tools and technologies, for off-farm activities.

3.3. Sources and Methods of Data Collection

Both qualitative and quantitative data have been collected from both primary and secondary sources. Households' demographic and socio-economic characteristics are collected from the sample households by using a semi-structured questionnaire. Trained enumerators fill the questionnaire by interviewing the sample households from users (participants) and non-users (non-participants) of productive safety net program in the proposed area. Concerning households' annual income data, sample households are asked to state their annual income from crop, livestock and off-farm income generating activities. The collected values of annual income items are computed in terms of birr of sample households.

Secondary data relevant for this study has been collected from various sources like Bureau of Agriculture and rural development and other relevant private and public institutions like District and Kebeles Administrations in the study area and Woreda food security program to supplement primary data. In the formal sample survey, semi-structured questionnaire will pre-tested to elicit new information before the formal survey is carried out. Training will be given to enumerators about the questionnaire and follow up has been made to ensure that the process of data collection is smooth. Then the questionnaire has been administered to collect pertinent data.

3.4. Sample Size and Method of sampling design

A three-stage sampling technique is adopted to generate the primary data. Firstly, Libo kemkem woreda out of the five woredas in south Gondar zone, where the program had been operating, was purposively selected. Secondly, out of the twenty two Kebeles four rural Kebeles from dega

and weyna dega were randomly selected. Thirdly, households in each of the four Kebeles were grouped into two strata. Stratum one represents PSNP participant and stratum two represents non PSNP participant. Finally the primary data for this study was collected from 210 households from 119 program participants and 91 non-participants in the study areas. Following this procedure, by using a formula provided by Yamane (1967) was used to determine the required sample size at 95% confidence level, 0.5 degree of variability and 9% (0.09) level of precision.

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

Where n is the sample size, N is the population size (total household heads size), and e is the level of precision.

The above formula provided 118 sample sizes of PSNP participants but equal size of non- participants was selected, however due to different reasons like lack of willingness to response and dislocation of the respondents only 210 (119 participant and 91 non-participant) households were interviewed. (As shown in Table 2) .PSNP has been launched in 22 of 29 Kebeles in the Woreda. The interviews were conducted to the household heads of the sample households.

Table 2: Sample size by kebeles

Agro-ecology	Sample Kebeles	Population Size (N)		Sample Size (n)	
		PSNP Participant	Non-PSNP Participant	Sample Households from Participant group	Sample Households from Non participant group
Dega kebeles	Bilbwuha	150	200	35	25
	M/debr	130	411	20	15
Weyna Dega Kebeles	Yifag	205	512	34	25
	A/Mantogera	510	552	30	26
	Total	995	1675	119	91

Source: own Computation result, 2016

3.5. Methods of Data Analysis

The impact analysis has been used both descriptive statistics and econometric model. Among econometric methods propensity score matching employed to quantify important empirical results. Both descriptive statistics and econometric tools were used to analyze the empirical data. Both qualitative and quantitative data's are compiled sorted, edited, and represented with appropriate variables for encoding. After the data cleaned, information will coded, arranged into group variables, summarized, and tabulated for interpretation and analysis.

3.5.1 Descriptive Data Analysis

Descriptive statistical tools are very important to have a clear picture of the households included in the sample. Descriptive statistical techniques are employed for the purpose of describing the demographic, socio-economic structure of sample households and the impacts of PSNP on livelihood status in the study area. These analyses are conducted using descriptive statistics such as tabulation, mean, standard deviation, percentage, and to summarize, interpret and conclude the results. Socio- economic data and household attributes have been evaluated using statistical tools. The purpose is to understand the significance and magnitude of households' livelihood activities taking situation of households program impacts. The study population was categorized using tables, mean difference, and other appropriate statistical tools.

3.5.2 Econometric Analysis

Propensity score matching model was used to address the objectives /to evaluate the impact of PSNP on livelihoods of rural households.

Propensity score matching (PSM) method: According to Khandker *et al.*(2010) impact evaluation is the act of studying whether the changes in well-being are indeed due to the intervention and not to other factors. The main aim of PSNP was to ensure sustainability of food insecure households in addition to improve their livelihood status. To this effect, there is a need to see whether the intervention of PSNP has significant influence on the participant households

or not. However, to compare the before and after intervention difference, baseline survey was not conducted prior to the intervention of the PSNP in the study area. Therefore, this study uses PSM method because PSM is the appropriate method when such kind of problem arises.

Following Caliendo and Kopeinig (2005), there are some steps in implementing PSM. These are: PSM estimation, choosing matching algorithm, checking for overlap (common support), matching quality (effect) estimation and sensitivity analysis.

Propensity score estimation procedure:-Propensity score estimation is the first step in PSM technique. When estimating the propensity score, two choices have to be made. The first one concerns the model to be used for the estimation, and the second one the variables to be included in this model. In principle any discrete choice model can be used. Preference for logit or probit models (compared to linear probability models) derives from the well-known shortcomings of the linear probability model, especially the unlike of the functional form when the response variable is highly skewed and predictions that are outside the [0, 1] bounds of probabilities. For the binary treatment case, where we estimate the probability of participation versus nonparticipation, logit and probit models usually yield similar results (Caliendo and Kopeinig, 2005). For this study, logit model was used to estimate propensity score.

Regarding, the choice of variables Smith and Todd (2005) suggested that economic theory, a sound knowledge of previous research and also information about the institutional settings should guide the researcher in building up the model. However, concerning the inclusion (or exclusion) of covariates in the propensity score model the matching strategy builds on the CIA, requiring that the outcome variable(s) must be independent of treatment conditional on the propensity score. Hence, implementing matching requires choosing a set of variables X that credibly satisfy this condition.

According to Gujarati (2004), in estimating the logit model, the dependent variable is participation which takes a value of 1 if the household participated in a program and 0 otherwise. The mathematical formulation of logit model is as follows:

$$P_i = \frac{e^{Z_i}}{(1+Z_i)} \text{----- (1)}$$

Where,

P_i = is the probability of participation

e = represents the base of natural logarithms (2.718...)

Z_i = is a function of n-explanatory variables which is also expressed as:

$$Z_i = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \dots + \beta_n X_n + U_i \text{----- (2)}$$

Where,

$i = 1, 2, 3, \dots, n,$

β_0 = intercept term,

β_i = regression coefficients to be estimated or logit parameters,

U_i = a disturbance term, and

X_i = pre-intervention characteristics (explanatory variables like age, family size, level of education, land size, livestock e.t.c.)

The probability that a household belongs to non-participant category is:

$$1 - P_i = \frac{1}{(1+e^{Z_i})} \text{----- (3)}$$

In impact evaluation studies, covariates used for the model have critical importance and should be selected properly. In this research, explanatory variables were selected based on findings of prior works on the issue and the informal survey done prior to the actual survey work.

The effect of household's participation in the PSNP on a given outcome (Y) is specified as:

$$T_i = Y_i(D_i = 1) - Y_i(D_i = 0) \text{----- (4)}$$

Where T_i is treatment effect (effect due to participation in PSNP), Y_i is the outcome on household i , D_i is whether household i has got the treatment or not (i.e., whether a household participated in the PSNP or not).

Nonetheless, since $Y_i (D_i = 1)$ and $Y_i (D_i = 0)$ cannot be observed for the same household simultaneously, estimating individual treatment effect T_i is impossible and one has to shift to estimating the average treatment effects of the population than the individual one. The most commonly used average treatment effect estimation is the ‘average treatment effect on the treated (T_{ATT})’ which is specified as:

$$T_{ATT} = E(T | D = 1) = E[Y(1) | D = 1] - E[Y(0) | D = 1] \dots\dots\dots(5)$$

Since the counterfactual mean for those being treated, $E[Y(0) | D = 1]$ is not observed, there is a need to choose a proper substitute for it to estimate ATT. Though it might be thought that using the mean outcome of the untreated individuals, $E[Y(0) | D = 0]$ as a substitute to the counterfactual mean for those being treated, $E[Y(0) | D = 1]$ is possible, it is not a good idea especially in non-experimental studies. This is because it is likely that components which determine the treatment decision also determine the outcome variable of interest.

In our particular case, variables that determine household’s participation in the PSNP could also affect household’s livelihood. Therefore, the outcomes of individuals from treatment and comparison group would differ even in the absence of treatment leading to a self-selection bias. However, by rearranging and subtracting $E[Y(0) | D = 0]$ from both sides of equation 7, ATT can be specified as:

$$E[Y(1) | D = 1] - E[Y(0) | D = 0] = T_{ATT} + E[Y(0) | D = 1] - E[Y(0) | D = 0] \dots\dots\dots(6)$$

In equation 8, both terms in the left hand side are observables and ATT can be identified if no self-selection bias. That is, if and only if $E[Y(0) | D = 1] - E[Y(0) | D = 0] = 0$. However, this condition can be ensured only in a randomized experiments (i.e., when there is no self selection bias). Therefore, some identified assumptions must be introduced for non experimental studies to solve the selection problem.

Basically there are two strong assumptions to solve the selection problem. These are: Conditional independence assumption and common support condition.

Conditional Independence Assumption (CIA): The CIA is given as:

$$Y_0 Y_1 \perp D / X, \forall X, \dots\dots\dots(7)$$

Where \perp indicates independence

X -is a set of observable characteristics

Y_0 -non-participants and

Y_1 -participants

Given a set of observable covariates (X) which are not affected by treatment (in our case, participation in the PSNP), potential outcomes (livelihoods) are independent of treatment assignment (independent of how the households were selected in PSNP).

The implication of CIA assumption is that the selection is solely based on observable characteristics (X) and variables that influence treatment assignment (participation in PSNP) and potential outcomes (livelihoods) are simultaneously observed (Bryson *et al.*, 2002; Caliendo and Kopeinig, 2005). Hence, after adjusting for observable differences, the mean of the potential outcome is similar for $D = 1$ and $D = 0$. Therefore, $E(Y_0 / D = 1, X) = E(Y_0 / D = 0, X)$.

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 (Bryson *et al.*, 2002). The detail of this assumption is presented latter because the common support condition is one of the five steps of the implementation of PSM.

Based on the above two assumptions, the PSM estimator of ATT can be written as:

$$T_{ATT} = E[Y_1 - Y_0 / D = 0, P(x)] = E[Y_1 / D = 1, P(x)] - E(Y_0 / D = 0, P(x)) \text{ ----- (8)}$$

Where $P(x)$ is the propensity score computed on the covariates X . The above equation shows that the PSM estimator is the mean difference in outcomes over the common support, appropriately weighted by the propensity score distribution of participants.

Matching techniques and algorithms

The next step in propensity score matching is to get the matching algorithm which best matches the treated observations with untreated based on the propensity scores from the preceding step. Each of the matching algorithms has its own advantages and disadvantages and the attempt of the researcher is to select a matching technique which best fits to the data at hand. Here after, matching techniques frequently used in PSM and which were used in this research are discussed.

Matching estimators: After the estimation of propensity score, the second step in PSM is choosing among different matching estimators. In theory, several matching estimators (matching algorithm) of PSM are available. However, only the most commonly applied are discussed below.

Algorithm: - a precise step-by-step plan for a computational procedure that possibly begins with an input value and yields an output value in a finite number of steps/calculation with Arabic numerals.

Nearest Neighbor Matching (NNM):- It is the most straightforward and frequently used matching estimator in PSM. The individual from the control group is chosen as a matching partner for a treated individual with the least distance (that is closest) in terms of propensity score (Caliendo and Kopeinig, 2005). Several variants of Nearest Neighbor matching are proposed in different literatures which can broadly fall to “with replacement” and “without replacement”. In the former case, an untreated individual can be used more than once as a match, whereas in the latter case it is considered only once.

Matching with replacement involves a trade-off between bias and variance. If we allow replacement, the average quality of matching will increase and the bias will decrease while increasing the variance. This is of particular interest with data where the propensity score distribution is very different in the treatment and the control group (Smith and Todd, 2005).

A problem which is related to Nearest Neighbor matching without replacement is that estimates depend on the order in which observations get matched. Hence, when using this approach it should be ensured that ordering is randomly done. It is also suggested to use more than one nearest neighbor matching. Reduced variance will result from using more information to construct the counterfactual for each participant, with increased bias that results from on average poorer matches (Smith, 1997).

Caliper and radius matching: Caliper matching is used to avoid the drawbacks of bad matches resulted from the Nearest Neighbor matching(NNM) when the closest neighbor is far away, economists impose a tolerance level on the maximum propensity score distance (caliper). Caliper

matching imposes a tolerance level on the maximum propensity score distance (caliper) so that bad matches are avoided and hence the matching quality rises. In caliper matching individual from the comparison group is chosen as a matching partner for a treated individual that lies within the caliper (propensity range) and is closest in terms of propensity score (Caliendo and Kopeinig, 2005). However, caliper matching has a drawback of inability of choosing a reasonable tolerance level in advance (Smith and Todd, 2005).

Radius matching: a variant of caliper matching which is called radius matching (Dehejia and Wahba, 2002). Radius matching is used as an alternative to solve the drawback of caliper matching. In radius matching, the principle is to use not only the nearest neighbor within each caliper but all of the comparison members within the caliper. The advantage of this method is that it uses only as many comparison units as available within the caliper and therefore allows for usage of extra (fewer) units when good matches are not available. Hence, it shares the attractive feature of oversampling problem and avoids the risk of bad matches.

Stratification and interval matching: this approach partitions the common support of the propensity score into a set of intervals (strata) and to calculate the impact within each interval by taking the mean difference in outcomes between treated and control observations (Caliendo and Kopeinig, 2005). The basic question in this method is ‘how much strata should be used in empirical analysis?’ The answer to this question as noted by Cochrane and Chambers (1965) is using five strata can reduce 95% of biases.

Kernel and local linear matching: kernel matching (KM) and local linear matching (LLM) are non-parametric matching estimators that use weighted averages of all individuals in the control group to construct the counterfactual outcome and have the potential of overcoming the problems of only a few observations from the comparison group are used to construct the counterfactual outcome of a treated individual that other estimators have in common (Caliendo and Kopeinig, 2005). These methods use more information and hence advantageous in lowering variance. However, they also have a drawback of the probability of using observations having bad match which leads to the importance of imposing the common support condition (Caliendo and Kopeinig, 2005).

As Smith (1997) noted when applying Kernel matching one has to choose the bandwidth parameter. The choice of the bandwidth parameter is quite pertinent with the following tradeoff arising: High bandwidth-values yield a smoother estimated density function, therefore leading to a better fit and a decreasing variance between the estimated and the true underlying density function. On the other hand, underlying features may be smoothed away by a large bandwidth leading to a biased estimate. The bandwidth choice is a compromise between a small variance and an unbiased estimate of the true density function and it may not be a predetermined issue.

Weighting on propensity score: Given several matching estimators algorithm, which approach is selected is the basic question. According to Caliendo and Kopeinig (2005) there is no the best fit algorithm fit to all cases. Rather the choice depends on the data in hand.

Region of common support and overlap condition: Imposing of common support is the third important step in PSM because average treatment effect on treated and on population is only defined in the common support region (Caliendo and Kopeinig, 2005). The common support region is the area within the minimum and maximum propensity scores of treated and comparison groups, respectively and it is done by cutting off those observations whose propensity scores are smaller than the minimum and greater than the maximum of treated and comparison groups, respectively (Caliendo and Kopeinig, 2005). Density of comparison households: density of treatment households 0 region of common support of propensity score 1.

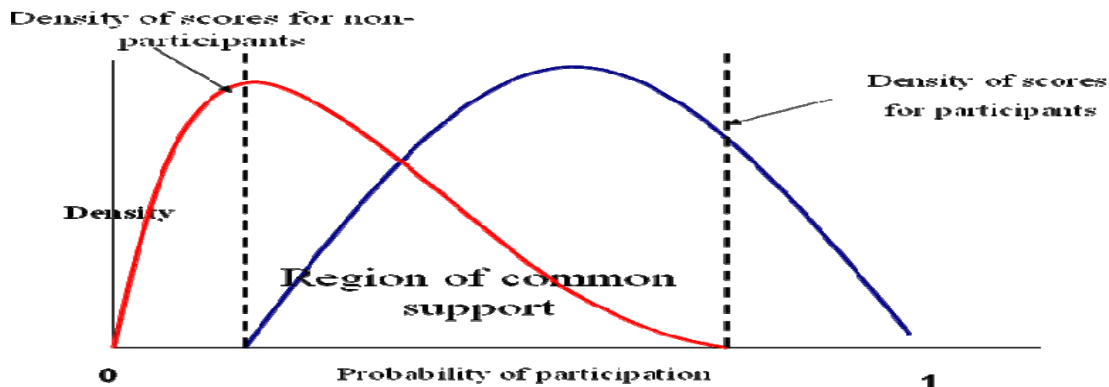


Figure 4. Region of common support condition

Source: Ravallion, 2005

Sensitivity analysis

The other thing to be considered is that all matching estimators not exactly robust against hidden biases due to selection bias and unobservable characteristics. It is very important for every researcher to test the robustness of significant outcome variables by identifying different assumptions. Under the condition of non-experimental data analysis the problem of unobservable bias would be checked by sensitivity analysis test. The best thing to examine the unmeasured biasness of outcome variables in the selection process is to check the sensitivity of estimated ATT with respect to changes in Conditional Independence Assumption (CIA). As stated by Rosenbaum (2002) the use of Rosenbaum bounding is the best approach to check the sensitivity responses on the statistically significant outcome variables. Rosenbaum bounds provide evidence on the degree to which any significance results show on untested assumptions. So, if the result of test showed sensitive the researcher should have to remind about the solution of this problem and design other estimating strategies.

3.6. Definition and measurement of Variables

The procedure after the selection of econometric models for estimation of experimental hypothesis is the choice of variables that can influence the expected outcomes and participation. Once the analytical procedure of the study and its requirements are known, it is necessary to identify the potential explanatory and dependant variables that will be used in the models. A combination of socioeconomic and demographic factors is used to explain household's participation in the PSNP and the outcomes in terms of household well being indicators in their livelihood.

3.6.1. Dependent variable

The dependent variable used in the PSM estimation has a dichotomous nature and is represented in the model by 1 for households participating in the Productive Safety Net Program and 0 for non participating households.

3.6.2. Outcome variables

Total annual household income: Annual income is a continuous variable and it is the amount of total income (measured in Birr) that a household has earned from different sources in the last twelve months. It is obvious that income earned from any source improves the livelihoods of the household. High-income families are less likely to be food insecure. Yilma (2005), Abebaw (2003) and Ayalneh (2002) found that income variable has a significant positive effect on livelihood. Hence, it is expected that households who have large income, are better in their livelihood.

Consumption expenditure: Total food and non-food consumption expenditure of the household for different purposes is computed by converting the one month food and non-food expenditure.

Livestock holding: It is the total number of livestock owned by the Households'. The value of livestock measured using TLU insights into whether this has occurred or not. Livestock population number was converted into TLU using conversion factor, accordingly the average total livestock holding in TLU in participant and in the non- participant per household. In Ethiopian case, livestock are mainly used for traction, food source, insurance in risky seasons etc. Mostly rural households save their capital in the form of livestock. This means that for the individual farmer (who usually have a high discount rate, but is also liquidity constrained) livestock has a dual role as a buffer for consumption smoothing and as an income generator (Anderson *et al.*, 2009). In the productive safety net program graduation manual livestock are one component to measure food self sufficiency. Therefore, the large livestock size indicates the positive effect of PSNP in accumulation of asset of household.

3.6.3. Independent variables

The independent variables of the model are those variables that will be expected to have relationship with the participation in the Productive Safety Net Program and the outcome variables were selected depending on available literature .The demographic, socio-economic and institutional factors hypothesized to affect the dependent variable and outcome variables are the following.

Age of the household head: It is continuous variable measured in years. Age of household head plays a significant role in increasing farm productivity by exerting his/her labour and also it may affect adoption to new technologies. Household head with young age will have strong labour which can produce more and seek new technologies to improve his/her livelihood. It is

hypothesized that the probability of being food self sufficient and preventing asset will be higher for young aged household heads. To make it precise, household head with old age above active and near to dependency age has a higher probability to be included in the PSNP program

Dependency ratio: This is the ratio of children under age 15 and old age of above 64 to dependent family size (total dependency ratio) expressed in terms of adult equivalent. The existence of large number of children under 15 and old age of above 64 in the family could increase households' probability of being in poverty status due to the fact that the working age population (active labor force i.e. 15-64 years) supports not only themselves, but also additional dependent persons in the family (Abebaw, 2003; Hilina, 2005). Thus, it is hypothesized in this study that a family with larger number of dependant family members (high dependency ratio) has a higher tendency of participating in Governmental and Non-governmental poverty reduction programs like the one considered in this study, implying a positive relationship with the dependent variable.

Household family Size/number (HHFS): is a continuous variable measured in terms of numbers of family in the household. Those who have a large size of family numbers implies having high manpower for on-farm and off-farm activities which generates income and will alleviate food gap of the households. The main hypothesis is that the farmer who has larger family size will be food sufficient with a better livelihood status.

Sex of Household Head (SEX): It refers to the sex of the household head taking a value of 1 for male and 0 for female. Labor supply plays a great role; due to lack of labor female headed household they are forced to rent their land. Male-headed households are in a better position to pull more labor force than the female-headed ones; sex of the household head is an important determinant of livelihood security in the study area. Women farmers may need a long adjustment period to diversify their income sources (Gladwin *et al.*, 2001). Based on this assumption, it is hypothesized that households who are female-headed, were more likely to gain from the program and probability of household to be participant will be higher for female headed than male headed.

Education level of household head: It is an essential factor for diversified activities in human

life. In the study area, the main occupation of the population is agriculture. The field of agriculture is dynamic by its nature. This is due to the continuous improvement in the research findings and technological advances. Education level could measure the household's human capital and therefore attainment of higher level of education is expected to provide higher levels of household welfare (Datt *et al.*, 2000). So, since the program is for food insecure households education level is hypothesized to have a negative effect on dependent variable (access of participating in the PSNP).

Land holding size of the household: Losses of farm land to other uses because of population pressure and limits to the amount of new land that can be brought into production are among the constraints of food production. As the land size increases, provided other associated production factors remain constant, the likelihood that the holder gets more output is high. This variable represents the total land holding size of a household in hectare. Bigsten and Abebe (2003) indicated that the size of cultivated land and poverty are negatively related. It has hypothesized to have a negative effect on dependent variables (participation in the PSNP).

Irrigation: This is a dummy variable assuming a value of 1 if the household head used irrigation and 0 otherwise. Large portion of the farming practice in Ethiopia is rain-fed. This type of farming system has the drawbacks that it is susceptible to climate fluctuation, single production period practice and full of uncertainties. Utilization of irrigation scheme whether it is modern or traditional could reduce the drawbacks of rain-fed farming system. Irrigation has a great contribution to increase productivity and enhances the income of the households as well. Irrigation use is expected to have a negative effect on dependent variable (participation in the PSNP).

Agricultural Extension service provision: It is a dummy variable taking the value of 1 if the household has access to extension service and practical training by development agents and 0 otherwise. Getting agricultural information frequently and utilizing will create good condition for the decision to use new technologies through participating in the program intervention and assure food consumption and prevent depletion of household asset due to shocks. In addition, frequent visit of extension workers helps to understand the food security status of households. For this

study, as a pre-intervention variable, the higher the extension contact with development agent causes better understanding of food security condition of household since they are members of community task force (CFSTF). Thus, it is hypothesized that, more extension visit is may lead to a high probability of being included in PSNP.

Credit service: It is a dummy variable that measure access to credit. The rural credit can be classified into two namely, credit for artificial fertilizer as well as farm tools and credit for household asset building. The pre-intervention credit will be linked with credit for farm tools and fertilizer. It is expected that those who have got enough credit to buy inputs for their farm can easily be food secured than those who did not participate in the program. Ganta (2011) indicated that a household that had participated in credit for fertilizer and other farm tools purchase is more likely to be food secured which is hypothesized to be negatively associated with the probability of being included in the PSNP since the household might have better food security status compared to others. Hence it is hypothesized that credit and being PSNP participant are negatively correlated.

Off-farm/non-farm income: This represents the participation of farmers in off-farm and non farm income generation activities expressed as a continuous variable. Agricultural production may not be the rural household's only source, or even their most important source of income. The rural people have multiple livelihood strategies. Hence, it is expected that the participation in off farm/non-farm income generating activities is positively associated with household asset. Therefore, it is hypothesized that participation in off-farm/non-farm income generation increases the probability of being non- PSNP beneficiary.

Access to food aid: It is a dummy variable taking the value of 1 if the household has accesses to have gotten food aid in kind or by cash from any governmental and non-governmental organization and 0 otherwise. To solve temporarily the lack of food self sufficiency and as well as asset formation, there should be an aid from individuals, government and non-government organizations. Thus, it is hypothesized in this study that a families or households have gotten aid frequently has a higher tendency of participating in Governmental and Non-governmental poverty reduction programs like the one considered in this study, implying a positive relationship with the dependent variable.

Participation in Social Net works /institutions: it is a dummy variable measured in terms of capability of the household participating in different social net works, 1 if the household is capable of participating in different social net works implies the household is in sustainable livelihood status, 0 otherwise.

Technology usage of the household: it is a dummy variable 1 if the household used different agricultural inputs and technologies that increase its on-farm income by which the household improve and sustain its livelihood status, 0 otherwise.

HHs Distance from development Agent office in kilometer: it is a continuous variable measured in kilometers. Visit of development agent (access to extension services) depends on the nearest of the HH residence to DA's office has a positive influence on the livelihood status and sustainability of PSNP beneficiaries because farmers who have access to extension services get training that enhance their knowledge. Hence, it is hypothesized to have a positive sign on PSNP HHs in this study.

3.7. Model Diagnostics

3.7.1. Multicollinearity

Existence of strong Multicollinearity affects the parameter estimates of the regression models seriously. So, it was necessary to check the occurrence of Multicollinearity among the independent variables. Accordingly variance inflation factor (VIF) technique was used to detect the problem of Multicollinearity for continuous variables (Gujarati, 2004). Every selected variable is regressed on all the other variables, the coefficient of determination (R^2_j) being constructed in each case. There exists strong linear relationship among the explanatory variables if VIF value is large. VIF value greater than 10 is used as a signal for the existence of a severe Multicollinearity among the explanatory variables. VIF can be defined as:

$$VIF(X_i) = \frac{1}{1-R_i^2}$$

3.7.2. Heteroscedasticity

The other problem in regression analysis is the problem of heteroscedasticity in the variables. To check for heteroscedasticity, robust standard errors were used to analyze the data by employ in stata version 12 software.

Table 3: Summary of variables definition and measurement

Variable	Type and definition	Measurement
Dependent variable		
Participation in the PSNP	Binary, participation in PSNP	1 for participant household and 0 for non- participant ones
Outcome variables		
Consumption Expenditure	Continuous, mean monthly HH food and non-food consumption expenditure	Birr
Livestock Holding	Continuous, number of livestock owned	Tropical Livestock Unit
Household annual income	Continuous, income from different source	Birr
Consumption of durable goods	Amount of Consumable durable goods(in ETB)	Continuous
Explanatory variables		
Age	Continuous, age household head	Number of years
Sex	Dummy Household head	(male=1, female=0)
Dependency ratio	Continuous, ratio of number of active labor to total family size	Number
Family size	Number of family members Continuous (number)	Continuous
Education	Continuous, the class year completed by household head by	Number
Land size	Continuous, size of landholding	Hectare
Extension	Dummy, access to extension	1 if a household has access to extension and 0 if not
Irrigation	Dummy, access to irrigation	1 if a household has access to irrigation and 0 if not
Credit	Dummy access to credit	1 if a household uses credit service and 0 if not
Off/non farm income	Continuous, income from off-farm/non farm activities	Birr
Food aid	Dummy access to aid	1 if a household has access to aid and 0 if not
Distance from office	Distance from development agent office in kilometer	Continuous
Technology usage	Technology usage of the house hold Dummy	1=yes,0=otherwise
Participation of d/t social institutions	Capability of the house hold in participating in different social net works ,dummy	(1=capable; 0=otherwise)

4. RESULT AND DISCUSSION

The results of the study are presented and discussed in this chapter. The first section presents results of the descriptive statistical analysis. The second section deals with the discussion of the propensity score matching (PSM) model outputs.

4.1. Descriptive Results

A combination of different descriptive statistics was performed on the household data based on the households' observable characteristics. These include age of household head, family size and, dependency ratios, household head sex and marital status, education status, access to credit, farm land and livestock holding, and incomes. In some cases comparison also made to compare PSNP beneficiaries with non-beneficiaries.

4.1.1. Demographic characteristics of sample households

Age of household head, family size and dependency ratio

From Table 4. the average age of sampled household head is 45 years in the study area. The maximum age observed was 91 whereas the minimum was 24 years. The result explains that the average household family size in the sample consists of 4.6619 persons. The average household size for participant is lower than non-participant which is 4.56 and 4.791persons, respectively. With respect to the specific characteristics of participant and non-participant households, household size was in determining the state of engaging livelihood activities, in such a way that a household with large family size tends to be engaged in on farm and off-farm activities than those with small numbers.

Dependency ratio: Dependency ratio is affected by family size and age structure. The mean dependency ratio for participants was 1.045824 and 1.012269 for non-participants with the mean difference of 0.034. There is a significant mean dependency ratio difference between participants and nonparticipants at 5% probability level. It means that the participant in the program have more dependent families (member of family aged under 15 years and aged above 65 years) than nonparticipant. This indicates that, as the dependency ratio is one of the factors to participate in PSNP program. In this pre-intervention variable the alternative hypothesis is accepted.

Land holding:-Land is the most important resource in agriculture. The fertility status, location and other attributes of land in association with its size make it a binding resource in agriculture. In the study area, the average land size owned by participant and non-participant households was found to be **0.542437** ha and **1.046703** ha, respectively. The overall average land holding was **0.76095** ha. The result of the t-test shows that the mean difference between the two sample groups with regard to size of land holding was found to be statistically significant at 5 percent probability level($t=-4.62$). This indicates that, the average land size of participant households was smaller than non-participant groups. Large land size favored crop production of non participant before program intervention which made them better-off and not to be included in the PSNP targeting.

Table 4 Average household age, size, and dependency ratio

Variables	Total Sample		Participants		Non- participant		Mean difference	T-value
	Mean	St.dev	Mean	St.dev	Mean	St.dev	mean	
Age of household head	45.028	12.225	47.0840	10.994	42.3406	13.2549	4.743	2.833*
HH family Size	4.661	1.8050	4.56302	1.7155	4.79120	1.91784	-.228	-.907
Dependency Ratio	1.026	0.9008	1.04582	0.9908	1.01226	0.772601	0.034	-.267**
Land size	0.7609	0.8206	0.54243	0.6374	1.04670	0.941092	-.5043	-4.62**

***, ** and * means significant at the 1%, 5% and 10% probability levels, respectively

Source: Own computation result, 2016

4.1.2. Description of sample households for categorical variables

From table 5, different activities are expressed by participants and non participants of the program. This table consists of percentage of extension service, access of irrigation, education status, Credit service and Food aid of households.

Credit service:-From Table 5, access to credit for participant is better than non-participants which are about 63.87% and 25.27%, respectively. The result showed in Table 5 indicated that there is a significant difference in credit access of households at 1% level of significance between the two groups. This result is also in line with Gilligan et al., 2008, which was relative to the comparison group, participants are more likely to be food secure, and are more likely to borrow for productive purposes, use improved agricultural technologies, and operate nonfarm own business activities.

Access to food aid:-From the total sample households, 51.90 % of them had an access to aid per a year. Around 77.31 % of the PSNP participant households had access to aid, while only 18.68% of non- participant households had access to aid with the mean difference of 0.586. The survey result revealed that PSNP participants had more access to aid. This indicates that the participants of PSNP have had a privilege having more access to aid than non participant counterparts.

Household head sex distribution and marital status:-From Table 4.2 with regard to the household head sex distribution and marital status; all 54.76 % sampled household heads are male and 45.24% are female headed. Compare participant households with non-participants, 36.97% and 78.02%) male headed and 63.03 % and 21.98% female headed, respectively. The result shows that as expected more female household headed are participated in the program and is statically significant at 1% probability level. Regarding the marital status of the household's heads in the sample, 57.14% of beneficiary household heads are married and that of non beneficiaries are 82.42% are married and is statically significant at 1% probability level.

Access to extension service:- As stated in Table 5, the analysis shows that participant households had better access to extension service than non-participant with 79.1% of PSNP participant and 77.3% of non participant sample households were visited by development agents

(DAs) at all in the year 2016 and which is statically significant at 10% probability level. With regards to this pre-intervention variable, the alternative hypothesis is accepted.

Education status: - Education level of household head: The mean education level of the total sample household heads is 1.72381 class years. It is 1.56 for program participants and 1.93 for non-participants. From the sample households, 49.05% are literate while 50.95% are illiterate. The education level of the two groups indicates that education had statistically insignificant difference between program participant and non-participant households.

Table 5. Educational statuses of households in the study area

Variables	Total Sample			Participants		Non- participant		T-value
	Category	Freq.	Percent	Fre q.	Percent	Freq.	Percent	
Education Status	Literate	103	49.05	56	47.06	47	51.6	2.75
	Illiterate	107	50.95	63	52.94	44	48.4	
Extension access	Yes	164	78.1	92	79.1	72	77.3	2.57*
	No	46	21.9	27	20.9	19	22.7	
Irrigation usage	Yes	94	44.76	54	45.38	54	45.38	0.20
	No	116	55.24	65	54.62	65	54.62	
Food aid	Yes	109	51.90	92	77.3	17	18.7	10.308*
	No	101	48.10	27	22.7	74	81.3	
Access to credit	Yes	99	47.1	76	63.9	23	25.3	5.98***
	No	111	52.9	43	36.1	68	74.7	
Sex of HHS	Male	115	54.76	44	36.97	71	78	6.45***
	Female	95	45.24	75	63.03	20	22	
Marital status	Married	143	68.1	68	57.1	75	82.4	-3.5***
	Unmarried	7	3.3	4	3.4	3	3.3	
	Divorced	30	14.3	23	19.3	7	7.7	
	Dead	30	14.3	24	20.2	6	6.6	

***, ** and * means significant at the 1%, 5% and 10% probability levels, respectively

Source: Own computation result, 2016

4.1.3. Descriptive statistics of outcome variables

Table 6. Presents descriptive statistics result of sample households based on their annual income, food and non-food monthly consumption expenditure as well as asset holdings in terms of Tropical Livestock Unit (TLU).

The sample households on average spent ETB 2065.274 per a month with a standard deviation of 1916.261 while this figure was 2506.019 ETB with standard deviation of 2123.297 for participant households and 1728.23 ETB per a month with standard deviation of 1673.6 for non- participant households. The statistical analysis revealed that the mean difference between the two groups in relation to consumption expenditure per a month was statistically significant by 5%. And also, Survey results show that the mean total annual income derived from sale of crops, animals, animal products and by-products and from off/non-farm activities of participants was Birr 14467.22 per households while, the mean total annual income of non-participants was birr 11469.03, which was statistically significance at 10%.

Livestock holding:-Livestock production plays an important role in the study area. Livestock provide milk, meat, traction power and transport, among others. Livestock species owned by the sample households include cattle, sheep and goat, donkey and poultry. The average livestock population owned by the sample respondents was 2.461in TLU. Table 6 shows that the average livestock holding was 3.7230 TLU and 1.4878 TLU for participant and non-participant households, respectively. The result of this study showed that the mean difference of the livestock holdings, in terms of TLU, between the PSNP participant households and the non-PSNP participant households was significant. The t-test also showed that this difference was statistically significant ($t = -6.374$) at 5% probability level. The PSNP participant households, as a result of PSNP intervention, have seemingly increased their livestock holdings. Thus, the program enables them to through avoidance of forced disposal in response to shock (increase) their livestock holdings.

Table 6: Total annual income, consumption expenditure and TLU of sample households

Variables	Total Sample(210)		Participants(119)		Non-participant(91)		Mean difference	T-value
	Mean	St.dev	Mean	St.dev	mean	St.dev	mean	
Total annual income	12768.2	18552.3	14467.2	19141.4	11469.2	17712.9	2,998.19	-1.161*
Consumption expenditure	2065.27	1916.26	2506.01	1673.59	1728.23	2123.2	777.785	-0.97***
TLU	2.461	2.763	3.7230	2.0396	1.4878	3.06	2.2477	-6.374**

***, ** and * means significant at the 1%, 5% and 10% probability levels, respectively

Source: Own computation result, 2016

Table 7. Impacts of PSNP to participate in different Social institutions

Year	Capable to participate	PSNP(treated groups)		Non PSNP(controlled groups)	
		Frequency	Percent	Frequency	Percent
2005	Yes	34	28.6	30	33
	No	85	71.4	61	67
2016	Yes	84	70.6	65	71.4
	No	35	29.4	26	28.6

Source: Own survey data, 2016

Regarding the capability of the HHs to participate in different social institutions characteristic is one of the most important factors that influence livelihood activities. As presented from the above table 7 the capability of the household to participate in different social institutions are the most characteristics perceived by the HHs in the study area. As noted from the table, before the intervention of the program there were not significance differences between the treated and

controlled groups in terms of the capability of the HHs to participate in different social institutions, 71.4% of the treated groups and 67% were not capable to participate in different social groups. But after the intervention of the program 70.6% of the treated groups are capable to participate in different social groups were as only 71.4% of the control groups are able to participate in different social groups. However compared to treated and controlled groups, though the participation in different social groups are increased for both groups but the treated groups by at least equal amount to the controlled groups are able to participate in different social groups, this is due to the impacts of PSNP intervention in the area.

Table 8. Impacts of the PSNP on consumption of durable goods

consumption of durable goods	Year	PSNP(treated groups)		Non PSNP(controlled groups)	
		Mean	St.d	Mean	St.d
	2005	208.1429	947.65	4.96	33.4
	2016	1101.55	1922.94	312.2	936.2

Protecting household asset from depletion is also the other objective of productive safety net program. Thus consumption outcome is one of the very important outcomes to evaluate the impacts of the PSNP. As depicted from the above table 8. Improving consumption of durable goods, from 2005 to 2016, has increased for both participants and non-participants. However for participants increased more than for non participants. To state it specifically participant's average durable goods consumption has improved from 208.1429 in 2005 to 1101.55 in 2016. While for non-participants has also increased from 4.96 in 2005 to 312.2 in 2016. It is argued that PSNP has positive impacts on the food and durable goods consumption for treated households during the implementation period when comparing with non participants.

4.2. Econometric Result

To examine the impact of PSNP on rural households' annual income, consumption expenditure and livestock holding, Propensity Score Matching (PSM) model was deployed. The major purpose of evaluating the impact of the PSNP is to measure differences in the intended outcome variables between the beneficiaries and their counterfactual, a proxy for what outcomes would have been for this group had they not received the program. This requires controlling for the effects of confounding economic and contextual factors that make program beneficiaries systematically different from an average non beneficiary. Therefore, this section describes the whole process of measuring impact of PSNP using propensity score matching method. It explains the estimation of propensity scores, matching methods, common support and balancing test.

4.2.1. Propensity scores estimation

Binary logistic regression model is used to estimate propensity scores to match the PSNP participant households and non-participant households based on the observable characteristics. In estimating the propensity score, the dependent variable used in the model was a binary variable indicating 1 for participation in PSNP and 0, otherwise.

As discussed earlier, the study focused on finding a set of conditioning variables coming from the theoretical grounds and based on information in the survey data should be highly associated with the probability of participating in the PSNP and with the outcomes of interest.

The model is estimated using STATA 12 software package using the propensity score matching algorithm developed by Leuven and Sianesi (2003). In the estimation process data from the two groups, namely, PSNP participant households and non-participant households were pooled and the dependent variable takes value of 1 if the household was a PSNP participant and 0 otherwise. Before running the regression model, the explanatory variables were checked for the existence of Multicollinearity and heteroscedasticity. The variance Inflation Factor (VIF) tests of the variables in the model showed that there were no serious problems of multicollinearity. Hence, all

explanatory variables are used for estimating the model. Robust standard errors were also tested to detect the problem of heteroscedasticity by using STATA 12 software. As a result of heteroscedasticity test showed that, $\chi^2(1) = 0.03$ with $\text{Prob} > \chi^2 = 0.8550$, it has been concluded that there is no serious problem of heteroscedasticity. The variables included in the model were hypothesized to influence household head's participation in the program and the outcome variables, household annual income, livestock holding and consumption of durable goods as well.

Table 9: Multicollinearity test for explanatory variables included in the multiple regression model

Variables	VIF	1/VIF
Family size	1.22	0.822546
Dependency ratio	1.15	0.871595
Land size	1.14	0.8756
Age	1.12	0.893084
Distance from DA	1.05	0.955405
Off-farm income	1.04	0.965497
Mean VIF	1.12	

Source: Own computation result, 2016

Table 10 presents the results from the logit model of participation in the program used to create propensity scores for the matching algorithm. The estimated model appears to perform well for our intended matching exercise. Even though R^2 is not meaningful in binary regressand models, the pseudo- R^2 indicates how well the regressors explain the probability of participation. Hence, the pseudo- R^2 value of 0.6566, in the logit regression, shows that the explanatory power of the matching variables is fairly low even before matching.

The estimated logistic regression model indicated that program participation was significantly

influenced by twelve of the sixteen explanatory variables used in the propensity score estimation model. These include age of household head, tropical livestock unit, access of aid, credit access, total annual income, land size, total consumption expenditure, consumption of durable goods, health extension access, technology usage Social participation, and extension access and use. Of the sixteen variables, five had negative signs and the remaining seven had positive signs.

As it was hypothesized that, age of household head had a positive effect on household's program participation, and were significant at 5% probability level. This is because of household head with young age will have strong labour which can produce more and seek new technologies to improve his/her livelihood. And that the probability of being food self sufficient and preventing asset will be higher for young aged household heads. Hence, since the programme at the beginning selected those in shocked, aged household head have high probability of program participation.

And also the access to aid, extension service had a negative and positive effect on households to participate in program, and was significant at 1 % and 5% probability level respectively. These is because of: A frequent visit of extension workers helps to understand the food security status of households; A families or households have gotten aid frequently has a higher tendency of participating in Governmental and Non-governmental poverty reduction programs.

On the other hand, size of land holding, access to credit and Irrigation had a negative effect on household program participation, and when size of land holding and access to credit are statistically significant at 5% probability level, access to irrigation is statistically insignificant. In other words, there is significant difference between participant and non- participant households in landholding and access to credit affected participation in the program negatively. The negative term indicates that, households relatively with large land size were not included in the program and those having small land size were targeted in the program. Large landholding is found to influence amount of farm product positively and livelihood

status of household which is directly related with the objective of PSNP. Livestock holding has a positive and significance influence on the participation decision of a given households. This may be due to people with large number of livestock may need additional feed other than crop residues in areas where grazing pasture becomes unreliable and accessing becomes difficult due to land shortage.

Most households with non-participant they cannot have an access to get a credit according to the estimation coefficient. This indicated that a household participated in credit for fertilizer and other farm tools purchase is more likely to be food secured. Since the household might have better food security status compared to others which indicates that rural credit services have a noticeable effect on program participation. The pre- intervention explanatory variables indicate that, households with better access to credit were found to be better-off and not included in the program.

Table 10: Logit results of household program participation

Variables	Coefficient	Std. Err.	Z value
Age	.0426834**	.013138	3.25
Sex	-.5692943	.334227	-1.70
Education	.0719667	.166027	0.43
landsizeinha	.5653151**	.1963895	-2.88
Extension	1.061475**	.4092037	2.59
Irrigation	-.2893432	.3207522	-0.90
Off farm income	.0000209	.0000687	0.30
Food aid	-2.046434***	.3961538	-5.17
Credit	-.9420336**	.3560394	-2.65
TLU	.2550865***	.0738268	-3.46
Total annual income	9.65e-06*	.0000121	-0.79
Total consumption expenditure	-.0001948**	.0000831	-2.35
Technology usage	.3438932***	.3754063	-0.92
Social participation	.6041972**	.4130202	1.46
Consumption of durable goods	.0002641*	.0001192	-2.22
Health extension service	-1.906316***	.4312913	-4.42

Constant	6.177023***	1.517854	4.07
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Number of obs =	210
LR chi2(16) =	188.68
Prob > chi2 =	0.0000
Pseudo R2 =	0.6566
Log likelihood =	-49.347485

***, ** and * means significant at the 1%, 5% and 10% probability levels, respectively

Source: Own computation result, 2016

4.2.2. Imposing common support region

After propensity score estimation, the common support region should be imposed on the propensity scores distribution of the PSNP beneficiary households and non-PSNP beneficiary households. As shown in Table 11, the estimated propensity scores vary between **0.013** and 0.997 (mean 0.816) for participant or treatment households and between 0.003 and **0.934** (mean = 0.246) for non-participant (control) households. The common support region would then lie between **0.013** and **0.934**. In other words, households whose estimated propensity scores are less than **0.013** and larger than **0.934** are not considered for the matching exercise.

Table 11: Distribution of estimated propensity scores

Group	Obs	Mean	Std. Dev	Minimum	Maximum
Total households	210	0.572	0.374	0.003	0.997
Treatment households	119	0.816	0.217	0.013	0.997
Control households	91	0.246	0.279	0.003	0.934

Source: Own computation result, 2016

Figure 5 shows the distribution of households with respect to the estimated propensity scores. It indicates that most of the treatment households are found at the center and few of them are found to the right of the distribution. While many parts of the control households are also found at center and few of them are found in the left hand side of the distribution.

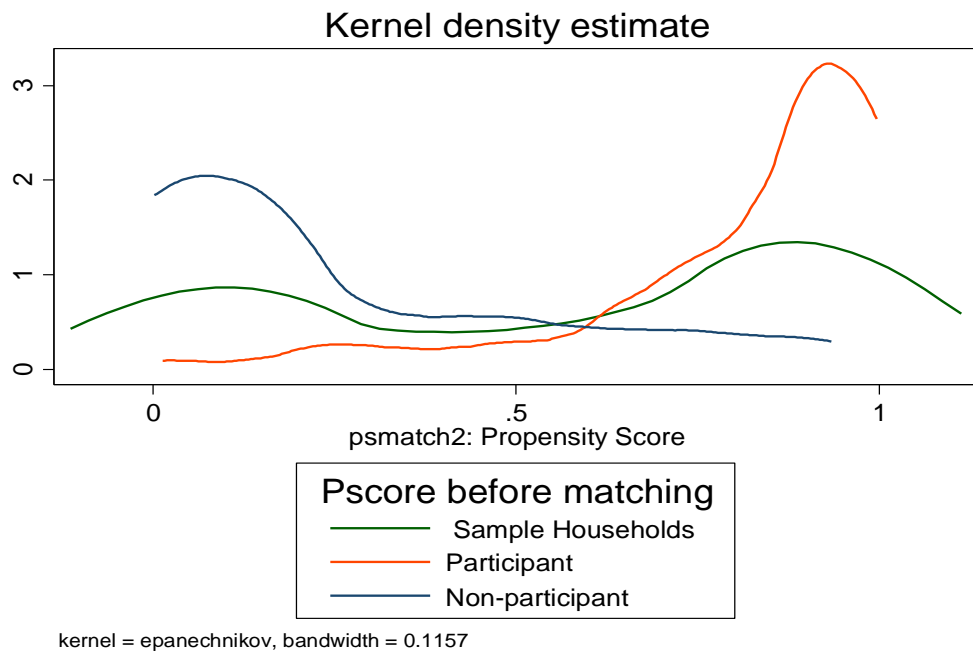


Figure 5: Kernel density of propensity score of all households

Source: Own computation result, 2016

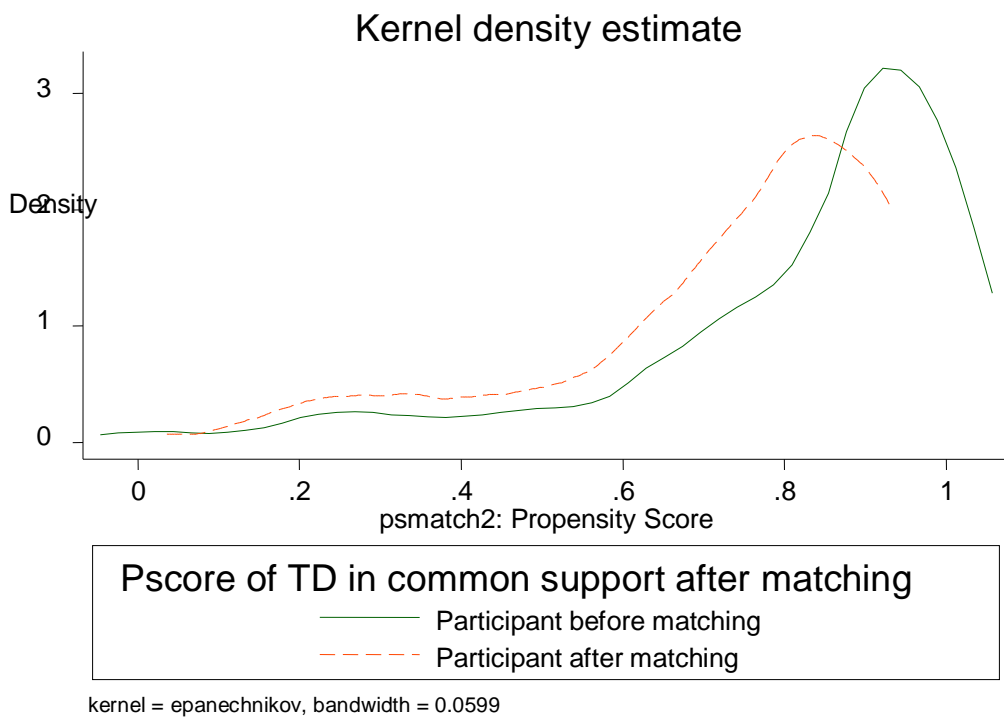


Figure 6: Pscore of treated in common support after matching
 Source: Own computation result, 2016

Figure 6 shows the distribution of treated households with respect to the estimated propensity scores, where the largest and dotted lines graph indicates the treatment households in the common support region, the line graph on the dot indicates the treated households after matching.

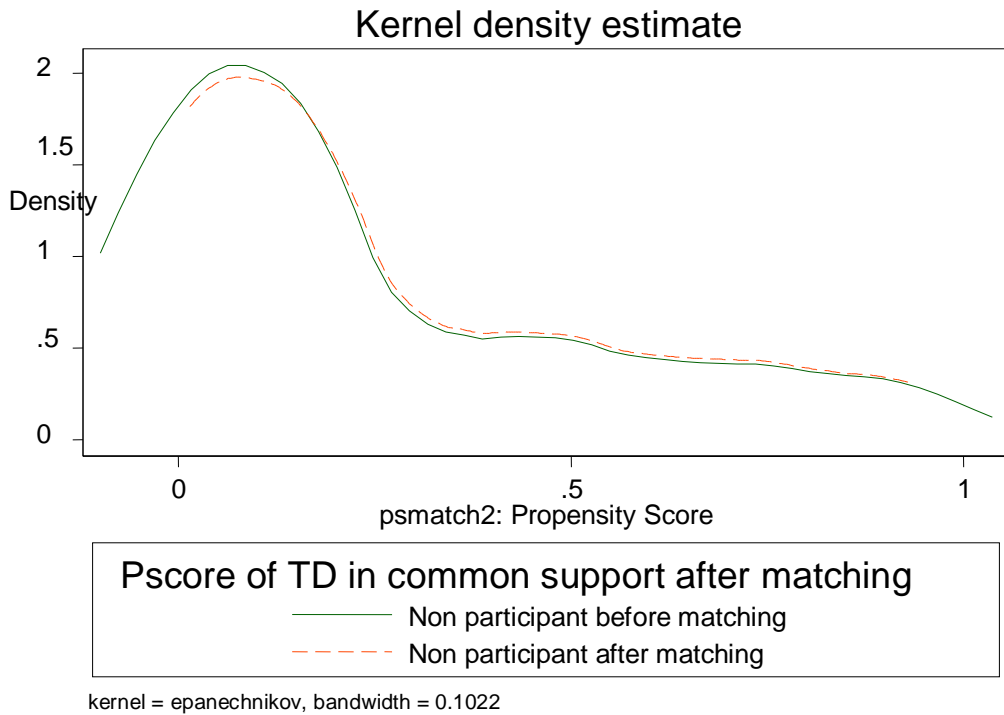


Figure 7: Pscore of control in common support after matching
 Source: Own computation result, 2016

Figure 7 shows the distribution of control households with respect to the estimated propensity scores after matching, when the largest and dotted lines graph indicates the control households in the common support region, the line graph on the dot indicates the control households after matching.

4.2.3. Choosing a matching algorithm

The vast majority of studies using PSM employ different criteria in choosing between different matching algorithms that is, among alternative ways of using the propensity score to match comparison units with treated units. To choose the best matching estimator for the analysis, different guiding criteria, such as equal means test referred to as the balancing test (Dehejia and Wahba, 2002), low Pseudo R^2 and matched sample size were taken into consideration. Matching estimators like nearest neighbor, caliper radius matching and kernel with different band width were tested. Thus, a matching estimator which balances all the explanatory variables that results insignificant mean differences between the two groups, bearing low pseudo R^2 value and also results in large matched sample size was taken as the best estimator. Results show that among estimators, Nearest neighbor from 1 to 4 and kernel and caliper radius with band width 0.01,0.1,0.25 and 0.5 have the same Pseudo R^2 , matched sample size and equal means test referred to as the balancing test as shown in Table 12.

Here balancing test means is a test conducted to know whether there is a statistical significant difference in the mean values of covariates before and after matching. The preferred estimators are the higher the number of covariates with equal mean after matching. Keeping other selection criterion, the balancing test indicates the quality of the matching algorithm implemented.

Table 12. Performance of matching estimators under the three criteria

Matching Estimator	Performance criteria		
	Balancing test*	Pseudo R2	Matched sample size
Radius Caliper matching			
With 0.01 band width	7	0.5000	39
With 0.1 band width	7	0.5000	59
With 0.25 band width	7	0.5000	65
With 0.5 band width	7	0.5000	87
Kernel Matching	7	0.5000	
With 0.01 band width	7	0.5000	91
With 0.1 band width	7	0.5000	157
With 0.25 band width	7	0.5000	157*
With 0.5 band width	7	0.5000	157
Neighbor matching	7	0.5000	
1 neighbor	7	0.5000	144
2 neighbor	7	0.5000	157
3 neighbor	7	0.5000	157
4 neighbor	7	0.5000	157

Note: * signifies number of explanatory variables with no mean differences

Source: Own computation result, 2016.

As can be seen from Table 12, kernel with band width of 0.25 estimators have resulted in the lowest pseudo value, well balanced covariates and largest sample size by discarding only 51 households (47 program and 4 control households) from the sample. Hence, only the results obtained from this estimator were presented and discussed.

4.2.4. Balancing test

Table 13 shows the balancing test of covariates, which tests the significance of the mean difference between the matched and unmatched samples in terms of all the thirteen covariates used for the matching purpose. As Table 13 indicates, the unmatched samples of participant and non-participant households were significantly different in terms of certain characteristics. However, one looks to see that any differences in the covariate means between the two groups in the matched sample have been eliminated, which would increase the likelihood of unbiased treatment effects.

The calculated test result measures the balancing of the distribution of t-test, for each variable used in the regression; it calculates the t-test for equality of means in participant and non-participant group, both before and after matching. T-test is based on a regression of the variable on participant indicator. Before matching this is an un-weighted regression on the whole sample while after matching the regression is weighted using the matching weight and is based on the support sample. As the rows of the table differences were removed after matching.

According to the t-value of individual t-tests, similarities in the mean values between treatment and control groups in this matching estimator, relatively all of the variables have lower t-value (insignificant). This shows kernel band width matching is preferred as the best estimator of average treatment effect. Consequently, only the outcome from this estimator is used to meet the study objectives of estimating the impacts of PSNP on the livelihood in the households.

Table 13: Balancing test results of covariates using kernel band width matching estimator

Variables	Mean before matching (N=210)			Mean after matching (N=157)			T-test
	Treated (N=119)	Control (N=91)	T-test	Treated (N=72)	Control (N=85)	%bias	
Age	47.08	42.34	-2.83***	45.85	48.25	-19.7	-0.96
Dependencyratio	1.01	1.05	0.26	1.1	1.26	-17.6	-1.01
Familysize	4.56	4.79	0.90	4.64	4.81	-9.4	-0.54
Sex	0.37	0.04	6.45***	0.47	0.48	-2.6	-0.14
Education	1.57	1.89	2.54**	1.61	1.52	11.2	0.77
Landsizeinha	0.54	1.05	4.62***	0.63	0.95	-39.6	-2.44**
Irrigation	0.45	0.44	-0.20	0.38	0.24	27.5	1.79*
Extension	0.77	0.79	0.318**	0.76	0.78	-4.6	-0.27
Credit	0.64	0.25	-5.98***	0.5	0.51	-1.3	-0.07
Offfarmincome	2090.43	1041.76	-1.16	1466.3	1547.8	-1.3	-0.18
Foodaid	0.77	0.19	-10.30**	0.64	0.74	-24.7	-1.27
Technologyusage	0.61	0.74	2.00**	0.71	0.78	-14.9	-0.96
Distancefromda	1.88	1.65	-0.65	1.56	1.68	-4.7	-0.33

***, ** and * means significant at the 1%, 5% and 10% probability levels, respectively

Source: Own computation result, 2016

4.2.5. Treatment effect on the treated

The effect of PSNP on farmer's livelihood in annual income generation, livestock holding and expenditure were analyzed. The estimated results showed that there is a supportive evidence of statistically significant effect on outcome variables. Therefore the program participants:

1. Gain more mean annual income of Birr 6122.8 which in about 59.1% greater than the non- program participants,

2. In case of asset formation, Total Livestock holding in TLU is found to be more by 0.237 which is about 14.09% greater than the non-proram participants,
3. In consumption expenditure level of participants consume more by 562.98 birr per month which is 22.61% greater than the non-program participants and
4. Higher consumption of durable goods of birr 866.39 which is about 69.71% more than the non-program participant households.

The findings of the study revealed that, there are significant increments in mean livestock holding, annual income and consumption-expenditure of program participants as compared to the non-participants (Table 14).

Table 14. Impact of safety net participation on livelihood using ATT

Outcome variable	Sample	Treated	Controls	Difference	S.E.	T-stat
Total consumption expenditure	ATT	2489.13858	1926.1527	562.985802	460.474536	1.22**
TLU	ATT	1.68553442	1.4479166	0.237617755	.336152309	0.71**
Total Annual Income	ATT	10363.6806	4240.8529	6122.82762	1647.05241	3.72***
Consumption of durable goods	ATT	1242.74027	376.34722	866.393052	415.251209	2.09**

***, ** and * means significant at the 1%, 5% and 10% probability levels, respectively

Source: Own computation result, 2016

4.2.6. Sensitivity analysis

A sensitivity analysis is designed to provide a quantifiable increase in uncertainty when a key assumption is relaxed. The results of sensitivity analysis in PSNP program show that the effects on different outcome variables would be detected from any unobservable biases. The rbounds package provides analysts with convenient set of software tools for performing sensitivity tests. As noted by Rosenbaum (2002), sensitivity analysis for insignificant effects

on outcome variable is not meaningfully considered to test. Thus, sensitivity analysis is checked for the significant and lower bound outcome variables. The other values which correspond to each row of the significant outcome variables are p-critical values (or the upper bound of Wilcoxon significance level -Sig⁺) at different critical value of e^r .

Results show that the inference for the effect of productive safety net program intervention is not changing, though participant and non participant households have been allowed to differ in their odds of being treated up to 200% ($e^r= 3$) in terms of unobserved covariates. That means for all outcome variables estimated, at various levels of critical values of e^r , the p-critical values are significant which further indicates that we have considered important covariates that affected both participation and outcome variables. We couldn't get the critical value of e^r where the estimated ATT is questioned even if we have set e^r largely up to 3, which is larger value compared to the value set in different literature which is usually 2 (100%). Thus, it can be concluded that impact estimates (ATT) of this study are insensitive to unobserved selection bias and are pure effects of productive safety net program (Table 13).

Table 13: Results of sensitivity analysis on ATT results of outcome variables

Outcome variables	$e^r=1$	$e^r=1.5$	$e^r=2$	$e^r=2.5$	$e^r=3$
Total annual income	0	0	4.3e-15	2.0e-12	1.2e-10
Cons of durgoods	0	0	4.3e-15	2.0e-12	1.2e-10
Consum.expend	0	0	4.3e-15	2.0e-12	1.2e-10
TLU	0	0	4.9e-15	2.2e-12	1.3e-10

Source: Own computation result, 2016

Notr: $e^r = (\text{Gamma}) = \log$ odds of differential due to unobserved factors where Wilcoxon significance level for each significant outcome variable is calculated.

5. CONCLUSION AND RECOMMENDATIONS

5.1. Conclusion

In this study the impact of PSNP on households' livelihood and factors that determine program Participation and outcome variables have been studied using a cross sectional data from four selected rural Kebeles out of twenty two rural Kebeles of the woreda in Amhara Regional state. Three step sampling techniques were employed to select sample respondents. Firstly, Libo kemkem woreda out of the five woredas in south Gondar zone, where the program had been operating, was purposively selected. Secondly, out of the twenty two Kebeles four rural Kebeles from dega and weyna dega were randomly selected. Thirdly, households in each of the four Kebeles were grouped into two strata. Stratum one represents the treatment group and stratum two represents the control group. Finally the primary data for this study was collected from 210 households from 119 program participants and 91 non-participants in the study areas. Secondary data relevant to the study were also collected from relevant sources. The collected data and information were thoroughly analyzed using descriptive and econometric analyses.

Since the PSNP has targeted the poor and vulnerable households in a non-random manner, assessing the impacts of the program using a simple mean difference comparison of outcomes between participants and non-participants would lead to biased estimates. In order to circumvent this problem the study used the matching techniques called propensity score matching method, which is capable of extracting the impacts of a program for an individual participating in the program versus an individual not participating in the program in a nonrandom program setup and absence of baseline data.

Prior to employing the PSM method, a simple approach was used to measure the impacts of the program on the level of selected outcomes namely: total income from different sources, livestock asset holdings, total monthly consumption expenditure and consumption of durable goods of the households. Accordingly, the results indicate that program participants are better off in all the four outcomes of interest showing a statistically significant mean difference between participant and non-participant samples.

Moreover, descriptive and inferential results indicated that mean differences between program participants and non participants are statistically significant mean difference in terms demographic characteristics like, age, sex, marital status, dependency ratio, access to extension, access to credit food aid and land holding size of household heads. **However, the two groups have shown a statistically insignificant mean difference in terms of family size, education level and irrigation use.** The results of the logit model also indicated that program participation is significantly influenced by a combination of factors. For instance, households in the program where more likely to have large dependents, small land size and better access on agricultural extension. On the other hand, even if it is statistically insignificant, non-program households have shown more literate compared to program households.

Due to these differences, it was not possible to attribute the difference in the outcomes of the two groups exclusively to the program. Hence, finding a reliable estimate of the program impact thus requires controlling for all such factors adequately. In doing so, propensity score matching has trimmed out 157 households allowing for 72 participant households to be matched with 85 non- participant households. As a result, the after matching balancing test showed that all the differences in the covariate means between the two groups in the matched sample have been eliminated. Hence, a matched comparison of outcomes was performed on these households who shared similar characteristics except the program.

After matching participants in the PSNP with non-participants on the basis of some socio-economic, demographic and other variables, the study found out that the level of annual income, livestock asset holding, consumption expenditure and consumption of durable goods of the PSNP participants are 59.1%, 14.09% ,22.61% and 69.71% higher than that of non-participants respectively. This difference would suggest that the program is effective at increasing key welfare outcomes of participant households.

Generally the Productive Safety net programme in the study area brought a positive impact on the programme participant households' livelihood as expressed in terms of livestock asset, annual income and consumption status of the beneficiary households.

5.2. Recommendations

Based on the findings of this study, the possible recommendations which have important implications for pursuance of livelihood improvements are forwarded. From the results of the logit model, land holding size was found to have a negative relationship with households' probability of participating in the program. Hence, physical and biological conservation measures should be widely incorporated in the program to enable the participant households' enhance their income rather than expanding the land size. On the other hand, even if it's statistically insignificant, household head's irrigation use has shown a negative relationship with program participation. To address this, awareness creation program has to be incorporated in order to meet the objectives of the program and its impacts on livelihood security in the study area.

The results of the study showed that program participants are less encouraged to the access of education than non-participating household. Therefore, intervention measures to expand the access of education should be incorporated as one potential activity in the study areas to enhance the present impacts of the PSNP. Because the access to education service improves livelihood of households through improving households' ability of accepting new agricultural technologies like improved seed and chemical fertilizers.

The result of the study shows that, the program participant households have high dependency ratio than non-participant. Dependency ratio is affected by family size and age structure. And also this shows the presence of high fertility rate within the participants. This indicated that emphasis in working family planning programs is required. Therefore, the responsible body should revise the family planning program implementation in the woreda to integrate it with the PSNP programs

The result of the study shows that, the program participant households have high total annual income than non-participant. Therefore, the responsible body should graduate households from the program to give chance to other households.

REFERENCES

- Abadie. A and G. Imbens, 2004. Large Sample Properties of Matching Estimators for Average Treatment Effects (Previous Version: Simple and Bias-Corrected Matching Estimators for Average Treatment Effects), Working Paper, Harvard University.
- Abebaw Shimeles, 2003. Dimensions and Determinants of Food Security among Rural Households in Dire Dawa, Eastern Ethiopia. An M.Sc. Thesis Presented to the School of Graduate Studies of Alemaya University, Alemaya.
- ADB (Asian Development Bank), 2006. Impact Evaluation: Methodological and Operational Issues. Manila, Philippines.
- Alderman, H., 2001. *The implications of private safety nets for public policy*, Case Studies of Mozambique and Zimbabwe: In Africa Region Human Development Working Papers Series. Washington DC, USA: The World Bank.
- Anderson, B.R., Betti, S. Mazzuco and L. Mencarini, 2009a. Marital disruption and economic well-being: a comparative analysis. *Journal of the Royal Statistical Society, Series A*, 170(3): 781–799.
- Andersson, C., Aemayehu Mekonnen, and J. Stage, 2009b. Impacts of the Productive Safety Net Program in Ethiopia on livestock and tree holdings of rural households Environment for Development Discussion Paper Series 09-05.
- Ayalneh Bogale, 2002. Land Degradation, Impoverishment and Livelihood Strategies of Rural Households in Ethiopia: Farmers' Perceptions and Policy Implication. Vol. 8. Shaker Verlag, Germany
- Baker, L., 1960. Evaluating the Impact of Development Projects on Poverty. World Bank, Washington, D.C. p1.

Baker, N., 2000. Evaluating the Impact of Development Projects on Poverty, Hand Book for Practitioners. World Bank WashingtonDC.

Barrientos and A. Humle, J., 2008. Social Transfers and Growth: A Review Brooks World Poverty Institute Working Paper 52, University of Manchester.

Becker and Ichino, 2002. Evaluating the Impact of Development Projects on Poverty A Handbook for Practitioners. The World Bank Washington, D.C.

Bigsten. A. and Abebe Shimelse, 2003. The Dynamics of Poverty in Ethiopia,WIDER Conference on Inequality, Poverty and Human Well-being. Gothenburg, Sweden, 30-31 May 2003.

Bryson, A., R., Dorsett and S., Purdon, 2002. The Use of Propensity Score Matching in the Evaluation of Labour Market Policies. Working Paper No. 4, Department for Work and Pensions.

Caliendo, M. and S. Kopeinig, 2005. Some Practical Guidance for the Implementation of Propensity Score Matching, Discussion Paper No. 1588, University of Cologne.

Caliendo, M. and S. Kopeinig, 2008. Some Practical Guidance for the Implementation of Propensity Score Matching, Discussion Paper No. 1588, University of Cologne.

CSA (Central Statistical Agency), 2007. Population and Housing Census in Ethiopia. Addis Ababa.

Chambers, R. and G. Conway, 1992. Sustainable Rural Livelihoods: Practical Concepts for the 21st Century. IDS Discussion Paper No. 296. Brighton, UK, Institute of Development Studies.

Chambers, R., 1989. Editorial Introduction: Vulnerability, Coping and Policy. *IDS Bulletin.*, 2(2): 1-7.

Colin, A. and K., Pravin, 2005. *Micro-econometrics Method and Applications*. 1st edition, Cambridge University Press, New York. p49.

Corbett, J., 1988. Famine and Household Coping Strategies. *World Development.*, 16: 1099-1112.

Danziger, S.K., 2005. *The U.S. Social Safety Net and Poverty: Lessons Learned and Promising Approaches*. University of Michigan.

Datt, G., K. Simler, Mukherjee and G. Dava, 2000. Determinants of Poverty in Mozambique: 1996-97. Food Consumption and Nutrition Division, Discussion paper No. 78, Washington, D.C., International Food Policy Research Institute.

Dehejia, R. and S. Wahba, 1999. Causal Effects in Non Experimental studies: Reevaluating the Evaluation of Training Programs. *Journal of the American Statistical Association*, 94: 1053-1062.

Dehejia, R. and S. Wahba, 2002. Propensity Score Matching Methods for Non-experimental Studies. *The Review of Econometrics and Statistics*, 84(1): 151-161.

De Waal, A. 1989. *Famine that kills: Darfur, Sudan 1984-1985*. Oxford, UK, Clarendon.

Devereux, S. (2002), Social protections for the poor: lessons from recent international experience, IDS working paper 142.

Devereux, S., R. Sabates-Wheeler, M. Tefera, and H. Taye, /2006/. Ethiopia's Productive Safety Net Programme (PSNP): Trends in PSNP Transfers within Targeted Household. Sussex, UK and Addis Ababa, Ethiopia: Institute of Development Studies and Indak International Pvt. L.C.

DFID (Department for International Development), 1999. Sustainable Livelihoods Guidance Sheets. DFID Issue Paper, London.

Drinkwater, M. and M. McEwan, M 1992. Household Food Security and Environmental Sustainability in Farming systems Research: Developing Sustainable Livelihoods. Paper

Ellis, K., Lemma A., and J.P. Rud, [2010]. Investigating the Impact of Access to Financial Services on Household Investment. Overseas Development Institute.

Ellis, J. and A., Tengberg, 2000. The Impact of Indigenous Soil and water Conservation practices on soil productivity: examples from Kenya, Tanzania and Uganda. *Land Degradation and Development* 11: pp 19-36.

Ezemenari, K., A., Rudqvist and K., Subbarao, 1999. Impact Evaluation: A Note on Concepts and Methods, Poverty Reduction and Economic Management Network, World Bank: Washington DC.

FAO(Food and Agricultural Organization), 2001. Food Agricultural and Rural Development. In Stamoulis, K.G (ed) Current and Policy Research, Economic and Social Department.

FDRE (Federal Democratic Republic of Ethiopia), 2002. Food Security Strategy: Addis Ababa as Cited by Amdissa Teshome, 2006, a Paper for the Future Agriculture Consortium Workshop, Institute of Development Studies 20-22 March ,2006.

Felici, F., 2008. Economic Impact of Development Plan of 2007 -2013 in Tuscany.

Foster, G.E.; J. Greer, and E. Thorbacke, 1984. A Class of Decomposable Poverty Measure. *Econometrica* 52(3): 761-766.

- Ganta Gemea, 2011. Evaluation of the Effectiveness of Productive Safety Net Program in Reducing Food Insecurity at Household Level: The Case of Mierab Abaya Woreda, Gamogofa Zone, SNNPRS, Ethiopia. Haramaya University Thesis. presented to the Adaptive Planning Research Team Bi-annual Review Meeting, Mangu, Zambia, 13-16 April.
- Gilligan, O. D., J. Hoddinott and Alemayehu Seyoum, 2008. An analysis of Ethiopia's productive safety net program and its linkages. International Food Policy Research Institute. Washington D. C..3-23.
- Gilligan, D., J. Hoddinott, , N. Kumar, and Alemayehu S., 2009. An Impact Evaluation of Ethiopia's Productive Safety Nets Program. IFPRI. Washington, D.C.
- Habtamu Ali, 2010. Impact of Productive Safety Net program on Households Welfare and Labor supply in rural Ethiopia. Addis Ababa University Thesis.
- Heckman, H., and P. Todd, 1997. Matching as an Econometric Evaluation Estimator: Evidence from Evaluating a Job Training Program. *Review of Economic Studies*, 64: 605-654.
- Heckman, J., H. Ichimura, J. A. Smith, and P. E. Todd. 1998. Characterizing Selection Bias using experimental data. *Econometrica* 66 (5): 1017-1098.
- Hilina Mikrie, 2005. Dimensions and Determinants of Poverty in Pastoral Areas of Eastern Ethiopia: The Case of Shinile Zone in Somali National Regional State. An M.sc. Thesis Presented to the School of Graduate Studies of Haramaya University: 90.
- Imbens, G.W., 2000. The Role of the Propensity Score in Estimating Dose Response Functions. *Biometrika*, 87(3): 706-710.
- Jalan, J. and M. Ravallion, 2003. Estimating the Benefit Incidence of an Antipoverty Program

Leuven, E., and B. Sianesi, 2003. PSMATCH2: Stata module to perform full Mahalanobis and propensity score matching, common support graphing, and covariate imbalance testing. <http://ideas.repec.org/c/boc/bocode/s432001.html>. Version 1.2.3 \

Maxwell, S. and M. Smith, 1992. Household food security: a conceptual review. In S. Maxwell and T. Frankenberger, eds. *Household food security: concepts, indicators, and measurements: a technical review*. New York, NY, USA and Rome, UNICEF and IFAD.

MoARD (Ministry of Agriculture and Rural Development), 2004. Productive Safety Net Programme. Programme Implementation Manual, Government of the Federal Democratic Republic of Ethiopia: December 2004.

MoARD (Ministry of Agriculture and Rural Development), 2005 b. Productive Safety Net Program, Program Implementation Manual (PIM). Addis Ababa Ethiopia.

MoFED (Ministry of Finance and Economic Development), 2006. Ethiopia: Building on Progress; PASDEP (2005/06-2009/10) volume 3: main Text.

MoFED (Ministry of Finance and Economic Development), 2008. Dynamics of Growth and Poverty in Ethiopia (1995/96-2004/05). Development Planning and Research Department, April, 2008 Addis Ababa, Ethiopia.

MoFED (Ministry of Finance and Economic Development), , 2010. Productive Safety Net Program, Program Implementation Manual (PIM). Addis Ababa Ethiopia.

Munro, L.T. 2003. A Social Safety Net for the Chronically Poor? Zimbabwe's Public Assistance in the 1990s. Chronic Poverty Research Centre, Institute for Development Policy and Management, University of Manchester Manchester, UK April.

Oduro, A.D. 2010. *Formal and informal social protection in Sub Saharan Africa*. Legon, Ghana: Department of Economics, University of Ghana.

- Pauw, K., and L. Mncube, 2007. *Expanding the social security net in South Africa: Opportunities, challenges and constraints*. University of Cape Town, SouthAfrica: Development Policy Research Unit (DPRU).
- Ragsdale, T., and S. Ali, 1988. A Case Study of the Resettlement of Nomads in Somalia. pp. 205, 224.
- Rajeeve, H. Dehejia and Sadek Wahba, 2002. Propensity Score Matching Methods for Non Experimental Casual Studies. *Review of Economics and Statistics*, 84: 151-161.
- Ravallion M., 2003. Assessing the Poverty Impact of an Assigned Program.
- Ravallion M., 2005. Evaluating Anti Development Program. Policy Research Working Paper 3625, World Bank, Washington DC.
- Rosenbaum, P., 2002. *Observational Studies*. 2nd Edition. New York: Springer.
- Rosenbaum, P.R. D.B. and Rubin, 1983. The Central Role of the Propensity Score in Observational Studies for Causal effects. *Biometrika*, 70(1): 41–55.
- SC-UK. 2008. Cash, Food, Payment & Risk: A review of the Productive Safety Net Program, Save the Children UK, Addis Ababa.
- Slater, R. and J. Farrington, 2006. Introduction: Cash Transfers: Panacea for Poverty Reduction or Money down the Drain? *Development Policy Review*, 24 (5): pages.
- Smith, J. and P. Todd, 2005. Does Matching Overcome Lalonde’s Critique of Non-Experimental Estimators? *Journal of econometrics*, 125(1-2): pp305-353.
- USAID (United States Agency for International Development), 1995. Food and Nutrition Security Report. Washington DC.

WADO., (2012). Libo Kemekem Worda Agricultural Development Office Annual Report 2010/2011.

WEPLAUO., (2012). Libo Kemekem Worda Environmental Protection, Land Administration and Use Office annual report 2012.

Wheeler and Devereux, 2010. Cash Transfers and High Food Prices: Explaining Outcomes on Ethiopia's Productive Safety Net Program, Institute of Development Studies and Centre for Social Protection, University of Sussex, Brighton BN1 9RE, United Kingdom.

World Bank, 2000. Panama Poverty Assessment Priorities and Strategies for Poverty Reduction. Washington, D.C. 237

World Bank, 2001. World Development Report 2000/01: Attacking Poverty. Washington D.C.

World Bank, 2013. World Development Report 2014: Protecting the vulnerable during crisis and disaster: Part II Ethiopia's Productive Safety Net Program. Washington D.C..

Yibrah, H., 2010. Impacts of Productive Safety Net Program on Rural Households' Assets Protection and Consumption. The case of Adwa woreda, Northern Ethiopia. MSc. thesis, submitted in partial fulfillment of the requirements for the award of Masters of Science degree in economics (Development policy analysis), Mekelle, Ethiopia.

Yamane, Taro. 1967. *Statistics: An Introductory Analysis*, 2nd Ed., New York: Harper and Row.

Yilma Muluken, 2005. Measuring Rural Household Food Security Status and its Determinants in the Benishangul Gumuz Region, Ethiopia: The Case of Assosa *Woreda*. An MSc Thesis Presented to the School of Graduate Studies of the Haramaya University, Haramaya. 138p.

APPENDICES

Appendices 1: Conversion Factor for Tropical Livestock Unit (TLU)

Animal Category	Tropical Livestock Unit (TLU)
Ox	1.1
Cow	1
Heifer	0.5
Bull	0.6
Calves	0.2
Sheep	0.01
Goat	0.09
Donkey	0.5
Horse	0.8
Mule	0.7
Poultry	0.01

Source: Storck, et at. (1991)

Appendices 2: Multicollinearity test for explanatory variables

Variable	VIF	1/VIF
Familysize	1.22	0.822546
dependency~o	1.15	0.871595
Landsizeinha	1.14	0.8756
Age	1.12	0.893084
distancefr~a	1.05	0.955405
offfarminc~e	1.04	0.965497
Mean VIF	1.12	

Source: own computational result,2016

Appendix 3: Heteroskedasticity test

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity

Ho: Constant variance

Variables: fitted values of participationinpsnp

chi2(1) = 0.03

Prob > chi2 = 0.8550

Appendix 4: Impact of safety net participation on livelihood using ATT

Outcome variable	Sample	Treated	Controls	Difference	S.E.	T-stat
TConsExp	ATT	2489.13858	1926.15278	562.985802	460.474536	1.22**
Tlu	ATT	1.68553442	1.44791667	0.237617755	.336152309	0.71**
TAnnuInco	ATT	10363.6806	4240.85294	6122.82762	1647.05241	3.72***
consumptionofd~s	ATT	1242.74027	376.347222	866.393052	415.251209	2.09**

Source: own computational result, 2016

Appendix 5: Results of sensitivity analysis on ATT results of outcome variables

Outcome variables	$e^r=1$	$e^r=1.5$	$e^r=2$	$e^r=2.5$	$e^r=3$
Total annual income	0	0	4.3e-15	2.0e-12	1.2e-10
Cons of durgoods	0	0	4.3e-15	2.0e-12	1.2e-10
Consum.expend	0	0	4.3e-15	2.0e-12	1.2e-10
TLU	0	0	4.9e-15	2.2e-12	1.3e-10

Source: own computational result, 2016

Appendices 5: Survey Questionnaire

General Introduction

Dear respondent, my name is **Tsegaye Denberie**. I am master's degree student at University of Gondar in the department of **Agricultural economics**. Currently, I am conducting research for my thesis and my research topic entitled “**impact of productive safety net program (PSNP) on the livelihood of rural households** in Ethiopian Amhara region: the case of Libo Kemkem *Woreda*”.

The objective of this study is to assess impact of productive safety net program on the livelihood of rural households. The answer given by the respondents for this research will be kept confidentially and only used for the purpose of this study. The researcher also believes that real answers that the respondents give possess high importance that might be used by policy makers, planners and other aid and development agents that work on PSNP as poverty reduction program of the country hence, I ask you to be honest and forthcoming in your response. Furthermore, any information that you provide is valuable to this study. I would like to extend my appreciation and thanks for your cooperation and committing your precious time.

General Instruction

1. Name of the respondent is required
2. Make tick mark, or circle while responding the questions with choice
3. All responses are required to be answered by a household
4. Please clearly justify the questions that need your suggestions

Identification particulars

Name of enumerator: _____

Date of interview: _____

Name of interviewee _____

Name of Kebele: _____

Respondent (a) participant of PSNP (b) Non participant of PSNP

Signature: _____

PART I: Questions about sample respondents (For both the beneficiaries and nonbeneficiaries)

1. Household demographics

1.1. Basic household information

Ser/ No	Name of HH Members	Age	Sex	Relationship to HH Head	Marital status	Education (years of schooling)
1						
2						
3						
4						
5						

✓ Sex: (1) Male (0) Female

✓ Relationship: (1) Head (2) Husband/wife (3) Child (4) Brother (5) Sister (6) Grand Child (7) Daughter in law /son in law (8) other relative (9) Dependent (10) other non relative

✓ Marital status: (1) Un-Married (2) Married (3) Widowed (4) Divorced

2. Crop and Animal Husbandry

2.1. Do you have your own land?? 1= Yes 0= No

2.2 If yes, specify in hectares _____

2.3 What is the total size of your land holding by type?

1. Cultivated ----- 2. Grazing ----- 3. Fallow -----

4. Forest ----- 5. Other (specify) -----

2.4 How did you acquire your own land?

1. Inherited/gift from family 2. Land redistribution

3. Purchase 4. Other (specify) -----

2.5 Do you think that your piece of land is enough to support your household, if you do not use Other mode of land acquisition (if any)? 1=Yes = No

2.6 If no, what do you think is the reason?

1. Small size land 2. Lack of agricultural inputs

3. Large household size 4. Less fertile land

5. Others (specify) -----

2.7. Does your land utilize all your family labor? 1=Yes 0= No

2.8. If no, where do surplus labors go?

1=Go for labor selling 2=Collects firewood & Charcoal 3=Go to town for labor selling 4= Stay at village for nothing 5=Other Specify _____

3. Please explain your current livestock holding

Livestock type	Current Holding in no.
Calves	
Heifers	
Oxen	
Cow	
Donkey	
Sheep	
Goat	

4. How many of each of the following farm equipment do you have?

Types of farm equipment	Current holding
Mekotkocha	
Mensh (Fork Rake)	
Mofer,kenbir	
Erf	
Shovel, Spade (Akafa)	
Knife ,Gejera)	

5. Household food consumption expenditure

5.1. What are your staple foods? _____

5.2. From where do you get these food staffs?

Own Produced=1 Purchased=2 Food aid=3 Borrowed from the relatives=4

Gift from clan=5 Other specify _____

5.3. Please tell us the type and quantity of each food item and value for the seven days consumption?

Food item	Unit	Quantity	Value	Remark
Sorghum				
Maize				
Wheat				
Rice				
Milk				
Butter				

Meat				
Fenugreek(Habisha)				
Oil				
Sugar				
Salt				
Coffee husk/Hashara				
Other				

5.4. How is your monthly livestock productivity?

Type food		Quantity (Liters)	Produced (Liters)	Consumed (Liters)
1. Milk	Cow			
	Goat			
2. Butter	Kg			
3. Meat	Kg			
4. poultry	Egg			
	Meat kg			

5.5. Which of the following livestock products are always available in daily food for your family in this month (multiple-choice) 1= Meat 2=Milk 3=Egg 4= Butter 5=Other specify _____ 6=None

5.6. Do you think that what you produce is enough for your HH consumption? 1=Yes 2=No

5.7. If no, how do you cope up with it? _____

5.8. Which months are in food shortage/deficit in the year? _____

5.9. Do you get food aid from GO/NGO? 1=Yes 0=No

5.10. If yes, please explain the frequency of the aid you receive in the year by volume and types of food?

Food type	Unit	Volume	Frequency in year	Remark

Grains wheat	Kg			
Flour of CSB	Kg			
Oil	Lt			
Other				

5.11. Do you consume all or sell? (>2 choice)

1=Sell some 2=Sell All 3=Consume some 4=Consume all

5.12. Usually how many times per day do you eat in this year?

1=Once 2=Twice 3=Three times 4= As obtained

5=More than three times

6. Household's nonfood consumption expenditure.

6.1. Do you tell us the non-food consumption items in your family for the last one month?

Non-Food items consumed for the last month	Unit	Unit market price	Quantity	Total value (Birr)
Clothes for the HH members Seed				
Kitchen equipment				
Furniture				
Charcoal				
Fuel wood				
Kerosene				
Soap/omo				
Building materials				
Ceremonial expenses				
Social obligation like Idar				
Donation to religious inst.				
Water fee				
Medical expenses				
School fee				

Transport expenses				
Drinks				
Rents				
Farm implements				
Farm oxen				
Animal feed, veterinary service, labor cost etc				
Chemical				
Seed				
Fertilizer				
Others				

7. Household Income

7.1. What is (are) the major source(s) of your income?

1=Crop husbandry 2=Animal husbandry 3=Both 4=Aid

5=All the above 6= Other Specify

7.2. Please specify the source and amount of income you obtained from crop production in the last one year

No	Description of income Sources	Participations (1=Yes,0=No)	Annual income	Remark
1	From selling of sorghum			
2	From selling of maize			
3	From selling of coffee			
4	From selling of teff			
5	From selling of fruits			
6	From selling of vegetables			
7	From selling of tree			
8	Specify if any other			

7.3 Please specify the source and amount of income you obtained from Livestock and their product in the last one year

	Description of income sources	Participations (1=Yes,0=No)	Annual income	Remark
1	From selling of Calves			
2	From selling of Heifers			
3	From selling of Oxen			
4	From selling of Cow			
5	From selling of Sheep			
6	From selling of Goat			
7	From selling of Calves			
8	From selling of poultry			
9	From selling of Cow milk			
10	From selling of Goat milk			
11	From selling of Butter			
12	From selling of Egg.			
13	Specify if any other			

7.4. Please specify the source and amount of income you obtained from off/non-farm activities in the last one year

No	Description of income source activities	Participations (Yes=1,No=0)	Annual income	Remark
1	From petty trading			
2	Sale of labor			
3	Sale of Charcoal & fair woods			
4	Income from rent animals			
5	Remittances(relative/other)			
6	Specify if any other			

8. Access to Credit Service

8.1 Did you access credit service before the program (in 2004)?

a. Yes b. No

8.2 If yes, what were the sources of the credit?

a. Cooperatives b. Government d. Individuals e. others

8.3. Did you access credit service during the program (2005-2016)?

a. Yes b. No

8.4 If yes, what were the sources of the credit?

a. Cooperatives b. Government d. Individuals

e. others

8.5 What was the type of the credit you obtained?

1=Money /cash 2=Seed 3=Farm tools 4=Fertilizer

5=Pesticides 6= Other specify _____

8.6 What was the amount of credit you obtained from this source in birr?

The minimum _____Max _____

Part II: Questions about the PSNP program

1. Do you know when the PSNP started? 1=Yes 0=No

2. In how many program components did you participate?

1=One 2=Two 3=Three 4=Four 5=Five

6=Six 7=Seven 8= Eight 9=Nine

3. State the types of program component you participated in?

4. Who selected you to participate in the program?

1=Program office 2=Kebele administration 3=Office of agriculture

4=the community 5=Combination of some/both of them

5. For how many years did you participated in the PSNP?

1=One 2=Two 3=Three 4=Four 5= Five

6. Are you ready to continue what has been started by the program? 1=Yes 0=No

7. In your opinion, in which of the following parameters did the program has a positive impact?

1=Creating access to education 2= In improving human health

3= In improving animal health 4= In improving communications like health centre,

market 5= In improving sanitation & hygiene 6= In increasing income 7=

In alleviating poverty

8. Are you getting Regular Agricultural extension service and on farm training? (a) Yes

(b) No

8.1. If No what are the reasons? _____

9. Are you getting sustainable Health extension service? (a) Yes (b) No

9.1. If No what are the reasons? _____

10. Are you getting irrigation? (a) Yes (b) No

10.1 If yes, what is your total irrigated land size in hector? _____

10.2. If No, what are the reasons? _____

Part III: Retrospective variables (For both the beneficiaries and non- beneficiaries)

S/N	Description	Unit	Currently	June 2005
1	Age of household	Number		
2	Education level of household	Years of schooling		
3	Number of family size	Number		
4	Total land size	Hectare		
5	Number of working labor force	Number		
6	Experience in exercising traditional technology	1/0		
7	Membership of traditional and/or modern associations/cooperatives	1/0		
8	Distance to the nearest market	Km		
9	Distance to nearest health service Type of the health service: 1. health post 2. health clinic 3. health center	Km		
10	Distance to nearest veterinary service	Km		
11	Distance to nearest all weathered road	Km		
12	Distance to nearest water supply Type of the water service 1. hand dug well 2. spring 3.shallow well 4.river 5 others	Km		
13	Distance to nearest agricultural extension service	Km		

14	How many of each of the following household consumer durables do you have and what was their Market value? 1. bed 2. table 3. chair 4. radio 5. gas stove	Number		
----	--	--------	--	--

Thank you!