
Evaluating the Impact of the Productive Safety Net Program on Rural Household Income: Evidence from Kedida Gamela Woreda, Ethiopia

Submitted 18/07/24, 1st revision 25/08/24, 2nd revision 12/09/24, accepted 30/09/24

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Abstract:

Purpose: Ethiopian productive safety net program is one of the largest social protection programs in Africa, receiving significant attention from the Ethiopian government and from the giant donors. It has been under implementation for more than 14-years and till continue to undefined periods. Until the time of this study takes place the program passed four phases. The aim of this study is to evaluate the progress and make recommendations.

Design/Methodology/Approach: In this study, improvement in the livelihood of rural households is assessed by examining the impact of household participation in the program. Household participation is expected to improve household annual income, smooth different households' consumption and increase the size of livestock holding (TLU), children schooling expense, which are used in this study as indicator of the outcome of the program. Therefore, this study is designed to assess the impact of PSNP on livelihood of rural household (households' annual income, children schooling expense and size of livestock) in the study area.

Findings: The findings from this research help to suggest for policy makers to understanding the role of PSNP and maximize its use by designing strategies of enhancing the productive safety net program. This means that the study helps to know the effect of provision of incentives to enhance physical and productive asset activities. Moreover, the findings of the study help as baseline documents of PSNP impact on particular activities for the future researchers.

Practical Implications: The study serve as a bridge for other studies in the future on same and other related issue. It is also essential for community based organizations working in the study area and other areas with similar socioeconomic settings.

Originality/Value: To the best of authors' knowledge, only a few empirical studies have been done so far regarding to impact of PSNP in the Ethiopian context.

Keywords: Productive Safety Net Program (PSNP), Rural Household Income, Social Protection, Poverty Reduction, Ethiopia.

JEL codes: I38, Q12, O15, H53, R20.

Paper type: Research article.

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1. Introduction

1.1 Background of the Study

Social Safety Net Program (SSNP) is a global flagship program each in its scope and in its partnership method, having re-oriented a rural safety net to better responds to the wishes of food insecure households and creates productive investments to strengthen rural financial boom and environmental rehabilitation in worldwide (Uffelen, 2012). One of the most considerable challenges facing developing countries of South Asia and sub-Saharan Africa is persistent famine, drought and environmental instability with additional others (World Bank, 2016).

As a result, more than 820 million people in the world are still hungry. FAO estimates that more than 251 million Africans people live below the global poverty line; from this sub Saharan Africa countries share about 239.1 million people and in Ethiopia over 22 million people are living below the national poverty line (FAO, 2018).

Due to this prevalence of hunger and poverty, currently sub-Saharan Africa countries become chronically food insecure and vulnerable to shocks. One of government efforts to reduce this poverty and famine is by establishing social safety net programs. Social safety net programs take forms of government, private sector and community initiatives to transfer income or consumption towards poor households, protect vulnerable households from risks, and increase the social status of marginalized households (Suharto, 2009).

Many studies also support that social safety net program has positive impacts on local communities and economies to increase and diversify their household income source, food consumption, child and maternal welfare as well as fosters more investment in the education and health of children, and reduces child labor (FAO, 2004).

Ethiopia is one of the developing sub Saharan country, which has made significant progress in reducing poverty rate and experiencing significant economic growth towards Sustainable Development Goals (SDGs) over the past decades (MoA, 2018). This makes it one of the fastest growing economies in the world. One of the largest and most effective programs developed by the government to support people living in rural areas which constitute about 80% of the population is the Productive Safety Net Program (PSNP) (World Bank, 2016).

The Ethiopian Productive Safety Net Program was launched in 2005 and operates in rural areas of the country, supporting chronically food insecure households to ensure that their basic needs are met. The program aims to enable households to overcome vulnerabilities without eroding their assets and over time supporting household to build their income and accumulate assets (MoA, 2017).

Ethiopia PSNP is the second largest in Africa (after South Africa) and is one of the largest safety net programs in the world. Currently, more than ten million people have been supporting by it, a figure that is expected to expand in the coming years, potentially. The program was largely implemented by the GoE and is supported a range of development partners (MoARD, 2014).

Ethiopia's Productive Safety Net Program has been widely studied and is found to have positively impacted to vulnerable households' livelihood in diversified ways (IFPRI, 2013). According to PIM (2015), the PSNP mainly targets to help poor farmers who are vulnerable to food insecurity about six or more months in a year. Increasing household asset, diversifying household income and preventing asset depletion of the households and community asset building are the major points targeted to improve.

South Nations, Nationalities and people 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 Woreda through diversifying livelihood options. Kembata Tembaro Zone is one of the targeted and beneficiaries' Zone within its all 7 rural Woreda in SNNP region. Kadida Gamela Woreda is a targeted including 4050 participant households by focusing on its chronic food insecurity problems (WAO, 2021). Moreover, the Program is designed to protect household assets and ensure a minimum level of food Consumption by improving a household's income according to program implementation manual (PIM) goals.

In this study, improvement in the livelihood of rural households is assessed by examining the impact of household participation in the program. Household participation is expected to improve household annual income, smooth different households' consumption and increase the size of livestock holding (TLU), children schooling expense, which are used in this study as indicator of the outcome of the program.

Therefore, this study is designed to assess the impact of PSNP on livelihood of rural household (households' annual income, children schooling expense and size of livestock) in the study area. Moreover, the Program is designed to protect household assets and improve livelihood of households` and ensure a minimum level of food Consumption of households`. And it also designed to encourage households to increase incomes generated from agricultural activities and to build up assets

1.2 Statement of the Problem

As stated in MoFED (2018) with a population of over 110 million, Ethiopia is one of the fastest-growing economies in Africa. Despite these gains, Ethiopia is among the poorest countries in the world, with a low per capita Growth Domestic Product (GDP) of \$794. The country's economy is highly dependent on rain fed agriculture,

characterized by traditional and subsistent farming. That might be one of the reasons to increase the food aid from time to time, which made Ethiopia to become the food aid damp area and the poster child of the giant humanitarians (Paul Harvey, 2010). As part of the FSP, in 2005 the Government of Ethiopia started a major new initiative is called Productive Safety Net Program (PSNP). As a result, the PSNP has been conceived as one pillar of the Government's broader Food Security Program (MoARD, 2010).

Kadida Gamela Woreda is one of the chronically food insecure and vulnerable to drought and famine district in Kembata Tembaro Zone, Southern Ethiopia, where PSNP has been implemented since 2007. The district has 4050 beneficiary households by considering its chronic and transitory food insecurity problems (WoA, 2018). One of the approaches adapted to enable the farming households of the area is protect asset depletion at household level, to increase and diversify household livelihood assets and income source, to smooth household consumption and to increase productivity of their farm are the main goals according to (PIM, 2015).

To the best of author's knowledge, several empirical studies have been done regarding to the impact of PSNP in the Ethiopian context providing incompatible and debating results. For instance, studies conducted by Yibrah (2010), Yibeltal (2008), Gilligan *et al.* (2008) and Anderson *et al.* (2009) they analyzed the impact of PSNP on rural household's asset protection, livestock holding and tree planting and smoothing consumption using PSM technique, the finding shows that, the program had a significant positive impact on participants and enables them to retain their assets holding, increase their livestock holding and tree planting and smooth consumption.

On the contrary a study conducted by Tadele Mamo indicated that there was no significant difference in the values of asset holding between PSNP participants and non-participants. Similarly, there was no significant difference in values of change in assets over the specified period between the two groups (Tadele Mamo, 2011). Besides, PSNP has negative impact on asset creation.

The same significant negative impact on asset is also found by Gilligan *et al.* (2008) and Wheeler *et al.* (2010) Similarly, debating studies revealed by Habtamu (2011), Tadele (2011), Wheeler *et al.* (2010 and 2012) conclude that the PSNP impact on asset sustaining and accumulation was not significant.

However, those many country level studies have not addressed this study area and even if their findings are arguable, and they had not identified enough information about the impact of PSNP on livelihood of rural beneficiary household.

In this study, livelihood assets of rural households are assessed by examining the impact of household participation in the program. Household participation is

expected to improve household income, consumption expenditure 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 households' consumption through diversifying households' income sources. And it also intended to encourage households to increase incomes generated from agricultural activities and to build up assets. Hence, this study attempted to address the following research questions:

- What are the socio-economic characteristics of respondents in the study area?
- What are the factors that influence the rural households' to participate in the PSNP?
- What impacts do the PSNP schemes have on livelihood assets of beneficiary households in the study area?

1.3 Research Objectives

1.3.1. General Objective

The overall objective of this study was to evaluate the impact of Productive Safety Net Program on rural farm households' income improvement in Kadida Gamela Woreda, Kembata Tembaro zone Southern Ethiopia. Specifically, this study has the following two-fold objectives:

1.3.2. Specific Objectives

To examine the socio-economic characteristics of respondents in the study area, to identify factors that affect households' participation on the program (PSNP), to analyze the impacts of PSNP on livelihood of rural beneficiaries in the study area.

1.4 Significance of the Study

This study can give insight about the impact of PSNP on households' livelihood improvements strategy. The findings from this research help to suggest for policy makers to understanding the role of PSNP and maximize its use by designing strategies of enhancing the productive safety net program.

This means that the study helps to know the effect of provision of incentives to enhance physical and productive asset activities.

Moreover, the findings of the study help as baseline documents of PSNP impact on particular activities for the future researchers. Furthermore, the study serve as a bridge for other studies in the future on same and other related issue. It is also essential for community based organizations working in the study area and other areas with similar socioeconomic settings.

2. Literature Review

2.1 Definition of Key Terms and Concepts of PSNP

The term safety net is deduced from the hire-wire walker who is protected by a net if the walker comes down. The available safety nets must have the ability to prevent any walker from injury when there is a fall (Coady, 2004). From this reasoning, a safety net is applied to poverty reduction strategy of preventing people from falling into poverty or becoming poorer when they are faced with shocks (Elizabeth, 2015).

The term safety net was introduced in relation to structural adjustment programs introduced in developing countries during the 1980s to 1990s as a social mitigation program to address the adverse effect of economic reforms developed (Paitoonpong et al., 2008). This has been reformed from the initial conception of "... as some form of income insurance to help people through short-term stress and tragedies" (World Bank, 1990).

The initial definition by the World Bank reduces a safety net as a mechanism to redistribute income to those vulnerable to enhance their welfare through productive activities. This definition limits a safety net to only the vulnerable households without considering the degree of poverty. A safety net has been defined based on a research and policy design objectives. This leads to the three school of thoughts definition of a safety net as income-consumption, assets and risk management. The first school of thought defines a safety net by income and consumption (Bank, 2002).

The income-consumption approach to a safety net explains safety net as transfers of cash and food to low-income households who are threaten by livelihood shocks (Devereux 2000, Heemskerk et al. , 2004). Furthermore, (Devereux, 2000), defines a safety net as cash and food transfer to low-income households who are threaten by livelihood shocks. This definition is mainly used in studies exploring income improvement and livelihood strategies.

2.1.1 Economic thoughts of social safety net programs

The social safety net programs were first introduced in 1993. They are labor-intensive work scheme that provides able-bodied but vulnerable members of a community access to food in exchange for their labor, while at the same time creating generally sustainable assets for the community (DPPC, 1995). The PSNP recognizes that emergency responses to chronic food insecurity are not the most effective mechanism, because the same people require the same levels of support each year. What is needed is a more developmental approach that assists people to overcome their poverty and become food secure.

The PSNP delivers timely, predictable and appropriate transfers to assist this process (MoARD, 2017). This program also aimed at providing necessary assistance to

disaster affect population while avoiding dependency on free food and assisting in the alleviation of poverty. **“Demand-driven”** is an approach that empowers and builds rural households' confidence to embark on investments and income generating enterprises appropriate to their needs and capacity.

2.1.2 Social Protection Program (SPP) and Its ability to sustain households

The primary function of social protection is to reduce income poverty and prevent vulnerability. Poverty alleviation or reduction is achieved through raising household incomes, while income or livelihood vulnerability can be managed or reduced by stabilizing incomes vulnerability also has a social dimension, related to marginalization and exclusion, and this can be addressed through strategies that empower people. Recent paradigms on social safety nets in third world countries focus on 'graduation' and self-reliance. for low income household that have labor capacity, social protection expected to provide temporary support, and should promote sustainable livelihoods rather than dependence on 'handouts' (Devereu, 2012).

Safety net programs have been the concern of both governments and donors as a means of protecting the incomes and the standard of living of the poor and vulnerable. This has become paramount as a consequence of the fall in macroeconomic stability and structural adjustment measures. In addition, it has become an effective instrument which enhances poverty reduction through targeting the poor and vulnerable to manage and mitigate shocks in times of crises. The importance of safety nets to enhance the capability of household to manage risks efficiently and make investment to deal with future risk cannot be overemphasized (Subbarao *et al.*, 1997).

2.1.3 The Productive Safety Net Program (PSNP)

The Productive Safety Net Program (PSNP); is a social safety program by way of the authorities of Ethiopia targeting meals-insecure families. It represents a serious and innovative strive on the part of the government of Ethiopia to transport away from responding to persistent hunger thru emergency appeals towards an extra predictable reaction with predictable assets for a predictable trouble (Rachel and Ashley, 2006).

The Productive Safety Nets Program (PSNP) has been implemented by the Government of Ethiopia since January 2005, with technical and financial support from a joint donor groups. PSNP is also playing a key role in allowing people to feel secure enough in their income to take productive loans which they previously found too risky (Mulugeta and Hailemichael, 2008). Ethiopia's PSNP is a multi-year program targeted at those Woreda identified as chronically food insecure in 8 regions Tigray, Amhara, Oromiya, SNNP, Afar, Somali, rural Harari and Dire-Dawa. It provides cash and/or food transfers to the food insecure people to improve consumption, prevent asset depletion at the household level and create assets at the community level.

The program has two components, like public works and direct support where the former is labor-intensive community-based activities designed to provide employment for chronically food insecure people in exchange for labor; and the latter is the way to ensure support to those chronically food insecure households, who cannot provide labor at all, and have no other means of support (MoARD, 2014).

Payments to both public works and direct support beneficiaries can be made in cash or in kind. If the payment is in cash, a household receives 43 birr per day per person (5 work days in a month); and if the payment is in food, a household receives 15kgs of grain plus pulses and oil per month per person, (ANRM, 2019). The amount of public works payment, however, is dependent on the actual number of days of labor contributed by a household (MoA, 2013).

2.2 Empirical Literature Review

To the best of authors' knowledge, only a few empirical studies have been done so far regarding to impact of PSNP in the Ethiopian context. Generally, empirical evidence related to the impact of productive safety net program on rural community provides incompatible results. Some of the studies are based on data collected soon after the implementation of the program or based on cross sectional data, and some of empirical studies and evaluation reports have focused on household-level investigation.

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 show that PSNP has a positive impact on the rural community (Anderson *et al.*, 2011; Debela and Holden, 2014; Gebresilassie, 2014; Mohamed, 2017; Welteji *et al.*, 2017; Zoellick, 2014).

According to Debela and Holden (2014), the PSNP has positive impact on children schooling expense. The finding of Zoellick (2014) indicates that PSNP has positive impact through preventing households from selling productive assets; facilitating new investment, income increase, reductions in stunting and an increase in household food provisions.

PSNP has positive effect on consumption, livestock holdings and productive assets of the household as indicated by Gebresilassie (2014). The participation of household in PSNP has positive and statistically significant effect on food consumption and on their livelihood (Mohamed, 2017). However, some scholars conclude that PSNP has negative impact on the rural community (Mamo, 2011; Hayalu, 2014; Beshir, 2011; Gilligan *et al.*, 2009; Sabates, Wheeler and Devereux, 2010; Adimassu and Kessler, 2013).

Some of the negative consequences of the PSNP program were developing sense of dependency syndrome (Hayalu, 2014). According to Mamo (2011), household failed to enhance asset accumulation if they are incorporated under PSNP. According to the earlier researchers (Beshir, 2011; Gilligan *et al.*, 2009; SabatesWheeler and Devereux, 2010), PSNP has negative effect on welfare/asset building and consumption. Adimassu and Kessler (2013) reported that PSNP has also negative effect on soil erosion control measures.

Anderson *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.

2.2.1 Social and Economic Impacts of Social Protection Programs (SPP) 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 (DID) 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.

2.2.2 Social and Economic Impacts of productive safety net program 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- behaviors' particularly interims 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, Ashley, and Mulugeta, 2006).

The labor requirements of the PSNP draw labor 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 household income 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.

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).

Livestock 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.

In the productive safety net program graduation manual livestock are one component to measure better wealth rank of households. Therefore, the large livestock size indicates the positive effect of PSNP in accumulation of asset of household. According to Bigsten and Abebe, (2003) studies indicated that the size of farm land and household income are positively related, but farm land and participation to the PSNP is negatively related.

Off-farm/non-farm income represents the participation of farmers in off-farm or non-farm income generating activities. Agricultural production may not be the rural households' only source of income, 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 negatively correlated with participation to PSNP and positively correlated with outcome variables of the study that is household selected livelihood improvement.

2.2.3 Institutional Factors and productive safety net program (PSNP)

Institutional factors are crucial determinants for participating and non-participating to productive safety net program, like Credit service, food aid and access to extension are more expected determinant factors of this study. 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 and they have more income 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 negatively associated with the probability of being included in the PSNP and positively correlated with outcome variable of the study that is household livelihood improvement.

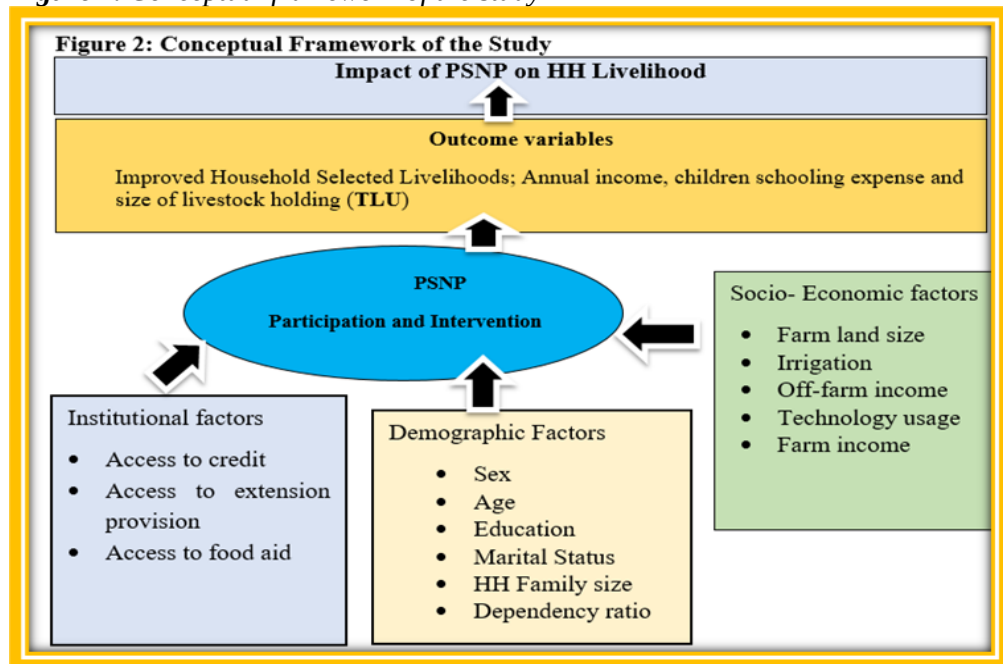
Agricultural Extension service provision: getting agricultural information frequently and utilizing will create good condition for the decision to use new technologies through participating in the program intervention and assure food consumption and prevent depletion of household asset due to shocks. In addition, frequent study, as a pre-intervention variable, the higher the extension contact with

development agent causes better understanding of food security condition and income status of household since they are members of community task force (CFSTF). Thus, more extension visit is may lend to a high probability of being included in PSNP and positively correlated with outcome variables of the study that is household livelihood improvement (Assefa, 2013).

2.3 Conceptual Framework of the Study

As clearly discussed in the literature review section and as revealed in Figure 1 below, the linkages between participating to productive safety net program and outcome variable expected to be influenced by independent variables which can be expressed in terms of household characteristics, socio economic, institutional and natural factors assumed to affect outcome variable and probability of participation to the PSNP considered by the study is presented as follows (Figure 2).

Figure 1. Conceptual framework of the study



Source: Own study.

3. Research Methodology

3.1 Description of the Study Area

Kembata Tembaro is one Zone in the SNNP Region of Ethiopia. It is bordered on the south by Wolayita Zone, on the west by the Omo River or Dawro Zone, on the North by Hadiya Zone and on the east by Halaba Zone. Based on the 2007 Census

conducted by the Central Statistical Agency of Ethiopia (CSA), this Zone has a total population of 2,106,596, of which 1,058,272 are men and 1,048,324 women; with an area of 13,311.94 square kilometers, the zone has a population density of 158.25 per square kilometer. 184,703 or 8.77% are urban inhabitants; the remaining 91.33% are rural inhabitants. The average land holding size in rural households of this zone is 0.5 hectare.

Kadida Gamela Woreda, which is situated in southern part of Ethiopia, is one of the Woreda of the Kembata Tembaro zone of SNNPR state. The Woreda is located approximately 350 km south west of Addis Ababa and 125 km North West from Hawassa capital of SNNPR (CSA, 2007). The district is geographically located between, 70 11N to 701N & 37050'30" E to 3804'30"E longitudes and the elevation of Woreda ranges from 1700 to 3028 m.a.s.l. (CSA, 2007).

3.2 Research Design

The study was adopted quasi-experimental and the descriptive survey research design that was used primarily to discuss and interpret data gathered from Primary sources of participant households (Treated group) Non-Participant households (Control group) of the program; that is called Quasi-experimental design. According to (Orodho, 2009) a descriptive survey is a method of collecting information by interviewing or administering a questionnaire to individuals. Survey design was suitable for this study due to the fact that it allowed interviewing real people directly and was useful in getting primary data.

3.2.1 Sampling procedure and Sample Size Determination

To select the sample for this study, three stages sampling methods were employed. In the firststage, four *Kebeles* were selected randomly from all beneficiary *Kebeles*. In the second stage, within four selected *Kebeles*, households were stratified into two strata (participant and non-participant in productive safety net program), which was considered as sampling frame of the study. Finally, representative samples were selected from four kebeles based on probability proportional to sample size. Systematic random sampling method was used to select a specific household in each kebele, which are the unit of analysis. The total targeted household is 23004 households.

To determine the sample size of the study area, the researcher have been used Yamane's formula (1967) (cited in Israel, 1992), at 95% confidence level, 0.5 degree of variability and 5% (0.05) level of precision.

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

Where; N = people of total population size, n = is number of sample size required e = the desired level of precision with the same unit of measure as the variance and e^2 is the variance of attribute in the population which was assumed to be (5%) (Table 1).

$$n = \frac{23004}{1 + (23004)(.05)^2} = 394$$

Table 1. Distribution of respondents with both participants and non- participants' in PSNP

No	Kebele	Targeted population			selected sample		
		Total household	Non participants	Participants	Participants	Non participants	Total sample
1	Azedabo	771	435	336	62	82	145
2	Jore	956	768	188	45	53	98
3	Teza-Garba	900	635	265	35	41	75
4	Dega-Kedida	722	449	273	35	43	76
	Total	3349	2287	1062	177	217	394

Source: Survey result.

3.2.2 Data Types and Sources

The study generated relevant data from both primary and secondary sources. As primary source, data were collected through questionnaire from sampled respondents. The questionnaire was developed in the way they measure the study objectives. Before the collection of actual data, the questionnaire was pretested. Following this, interview schedule was used to collect data from selected respondents.

In addition to interview structure, Key Informants (KIs) interview was employed to collect the required primary data that guide discussion with the concerned bodies to obtain in-depth information about different issues related with the study objectives. While the secondary source, data was collected from review of different document which were include research works, books, office documents, journal articles written by different scholars on the related issues.

3.2.3 Methods of Data Analysis

Data processing is critical part of the research operation including editing, coding, data entry, data cleaning and consistency checking and all activities are undertaken by the researcher. Both descriptive statistics and econometric tools were used to analyze the empirical data. After the data cleaned, information were coded, arranged into group variables, summarized, and tabulated for interpretation and analysis. These tools are outlined and discussed in the following section.

3.2.4 Descriptive and inferential Statistics

In descriptive statistics the researcher used percentage, mean standard deviation and frequency for comparison of the character of households. T-test and chi-square test were used to analyze the significance level of independent variables (t-test for independent continuous variables and chi-square for categorical independent variables). As inferential statistics, chi square was used to see the difference between PSNP participant and non-participant households across discrete explanatory variables of the study. Besides, independent t-test was used to compare mean difference between two groups across continuous explanatory variables. Data which were obtained from key informants and focus group discussion were analyzed using narration.

3.2.5 Econometric Model Specification

Impact assessment requires a group affected by the program intervention and a control group to compare the outcomes (Patricio and Geoffrey, 2009). In the case of this study, the intervention was productive safety net program. To deal with this problem, the Propensity Score Matching (PSM) technique was used, which, has gained popularity in recent years for its potential to remove substantial amount of bias from non-experimental data (Shahidur *et al.*, 2010).

3.2.6 Propensity score matching (PSM) method

Propensity score matching techniques is very important technique in evaluating the impact of certain intervention of social programs. The main reason for employing this technique is that firstly, it helps to adjust for initial differences between a cross-section of participant and non- participant groups by matching each participant unit to a non-participant unit based on similar observable characteristics. Secondly, it summarizes all the differences in a single dimension, the propensity score, which is then used to compute treatment effects (Guush and Cornelis, (2012). According to Shahidur *et al.*, (2010), the implementation of PSM involves six steps. These are estimation of propensity score, defining region of common support, choosing matching algorithm, testing matching quality, calculating average treatment effect on treated and sensitivity analysis.

3.2.7 Propensity score estimation procedure

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 is about the variables to be included in that model (Caliendo and Kopeinig, 2005). Concerning about the model, since this study has binary treatment (participation and non-participation in PSNP), application of Logit model was appropriate.

According to Gujarati (2004), in estimating the Logit model, the dependent variable should be dummy (participation in PSNP in this case) which takes a value of 1 if the household is participant in PSNP programme and 0 otherwise. According to Gujarati (2004), in estimating the Logit model the dependent variable is

participation which takes value of 1 if the household participated in a program and 0 otherwise. The Logit model is mathematically formulated as follows:

$$P_i = \frac{e^{Z_i}}{1 + e^{Z_i}} \quad (2)$$

P_i is the probability of participating to the program.

Where:

$$Z_i = \beta_0 + \sum \beta_k X_{ki} + U_i \quad (3)$$

The probability that household belongs non-participant of the program is

$$1 - p_i = \frac{1}{1 + e^{Z_i}} \quad (4)$$

The odds ratio is the ratio that probability of those participants divided by the probability of those non-participants is given by:

$$\frac{p_i}{1 - p_i} = \frac{1 + e^{Z_i}}{1 + e^{-Z_i}} = e^{Z_i} \quad (5)$$

The natural logarithm of the equation (4); the log of odds ratio can be given as follows:

$$L_i = \ln [p_i (1 - p_i)] = \beta_0 + \beta_1 X_{1i} + \dots \dots \dots \beta_k X_{ki} \quad (6)$$

L_i is log of odds ratio. Where i denotes i -th observation in the sample, p is the probability of outcome, β_0 is the intercept term, and $\beta_1, \dots, \beta_k$ are coefficients associated with each independent variable $X_1, \dots, X_k$ (Neupane, Sharma and Thapa, 2002; Thapa and Rattanasuteerakul, 2011).

In this study, explanatory variables of the Logit model have been identified from related previous empirical studies. According to Caliendo and Kopeinig (2005), only variables that influence simultaneously the participation decision and the outcome variable were included. This study has tried to include different variables, which influences both decision to participate in the program and outcome variable, to minimize the problem of unobservable characteristics in the study.

4. Results and Discussions

4.1 Descriptive Statistics Results of Respondents

Descriptive statistics such as mean, standard deviation, percentages and frequency; inferential statistics such as Chi square test (for categorical variables) and t-test (for continuous variables) were used to see relationship and mean differences between

participant and non-participant households. The two groups of sample respondents were compared and contrasted with respect to socio-economic and demographic characteristics so as to draw some important conclusion.

Age of the respondents: The result in Table 2, revealed that the maximum age of the respondent was 69 while the minimum was 28 years. The mean age was identified to be 43.9 years with standard deviation of 7.34. This reveals that both groups fall in economically productive age group from 15 to 64 years. The t-test value revealed that, there was significant mean difference at 1% significance level in household head age for the two groups.

Educational level of the respondents: As indicated in the result below the combined average education enrollment level of household head for sample respondents was grade 6.9. Moreover, the result indicates that the mean education enrollment for program participant household heads were up to grade 6 whereas for those non-participants in the program their average education attainment was up to grade 8. The result in education leveled that the sampled respondents on average attain primary education grade (1-8). The mean difference in education level between the two groups was statistically significant at 1% level of significance level. This indicates on average non-participant attain more grade than PSNP participants. So education level of household head is one of the factors to participate in PSNP program. In this pre-intervention variable the alternative hypothesis is accepted.

Family size of the respondents: A big family needs more resource than small family. Table 2 below also shows on average, program participants have 6 persons per household while 5 persons per household for non-participants. The mean difference in family size between program participants and non-participants was statistically significant at 1% level of significance. 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 participate to PSNP intervention.

Age dependency ratio: Age dependency ratio is the ratio of persons in the ages defined as dependent (under 15 and over 64 years) to persons in the ages defined as economically productive (15-64 years) in a population (CSA, 2014). The mean dependency ratio for participants was 28.58 and 20.80 for non-participants with the mean difference of 7.74.

There is a significant mean difference dependency ratio between participants and non-participants at 1% significant 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, PSNP respondents' have less productive force than NPSNP and dependency ratio is one of the factors to participate in PSNP program. In this pre-intervention variable the alternative hypothesis is accepted.

Table 1. Average household age, family size, educational level and dependency ratio

Variables	Total		Participants		Non-Participants		Mean.D	T- test
	Mean	Std.	Mean	Std.	Mean	Std.		
age head	43.9	7.3	45.3	7.8	42.8	6.5	-2.5	0.007
Famil size	6.9	2.7	6.5	0.9	4.7	1.2	-1.7	0.000
educhead	5.54	1.36	5.8	2.2	7.8	21	2	0.000
depratio	24.3	21.4	28.5	2.5	20.8	20.8	-7.73	0.000

Source: Own computation result.

4.2 Description of Socio Economic Characteristics of Sample Households

Respondent farm land holding: As a result indicated below Table 3, the average land owned by both participant and non-participant household was reported to be 0.467 hectare. The maximum land holding was 2 hectare while the minimum was 0.125 hectares with standard deviation of 0.312. The mean land holding of participants and non-participants was 0.531 and 0.389 hectare respectively.

The difference was significant at 1% of significance level. In relation to land size households with minimum land size have high probability of participating to the productive safety net program; hence the possible reason for this could be large land holder households are measured as more potential than small land holders to produce more food and improve their livelihood and food security safely; which helps them to protect their physical and human asset from depletion.

Farm income: The average income by both participant and non-participant household was reported to be 34377.59 Birr. The mean annual farm income of participants and non-participants were 34377.59 and 36667.88 Birr respectively. The difference was 5098.163 Birr; it is statistically significant mean difference between participants and non-participants at 1% significant level. It shows that the average annual income earned from farm income of non-PSNP participants were significantly higher than PSNP households at 1% level of significance.

In relation to households annual farm income of non-participant households were considered as more potential in producing more farm income than participants and improve their food security safely; which helps them to protect their physical and human asset depletion in the study area. This is because of as this study area, non-participant household heads may have large land size than participants or they are productive in their farm than beneficiary households.

Non-farm income: The mean annual non-farm income of participants and non-participants was Birr 7239.514 and 2525.622 respectively. As indicated below table 4 the combined average non-farm income of household head for sample respondents was 4643.284. The difference was Birr 4713; it has significant mean difference between participants and non-participants at 1% significant level. It shows that the average annual income earned from non-farm income of PSNP participants were

significantly higher than non-PSNP households. However, PSNP households earned about ETB 4713 annual income from PSNP public works and other non-farm activities that reduced the income differences which resulted significant income difference between the two groups. This suggests that participation of the poor households in such social welfares helps to reduce the income disparities among the rural households. Hence, it is expected that the participation in PSNP is positively associated with household livelihood.

The sources of income for sample households come from both farm and nonfarm activities. Farm income consists of both incomes from sales of livestock and livestock products and from sales of crops. Non-farm income sources are mainly from petty trade and daily works. However, PSNP sample households derive income from public works participation which increased their non-farm income sources.

Table 2. Descriptive statistics of socio economic variables included in the study

Variables	Total		Participants		Non-Participants		Mean.D	T-test
	Mean	Std.	Mean	Std.	Mean	Std.		
Farmland size	0.467	0.31	0.38	0.25	0.53	0.33	-0.467	0.007
Farm income	34377.57	12040	31569	11465	36667	12038	-5098	0.000
Nonfarm income	4643	3320	7239	2407	2525	2303	4713	0.000

Source: Own computation result.

4.3 Description of Sample Households for Categorical Variables

From Table 4, different activities are expressed by participants and non-participants of the program. This table consists of percentage of sex of household head, marital status, and extension service, access of irrigation, Credit service, technology usage, and Food aid of households.

Sex of respondent household head: As indicated in table 4, below from the total sampled household's male head share 72.6% and the rest 27.4% were female headed. With regard to the participation status of respondents in PSNP by sex, it was found that 39.55% of PSNP participants were female while non-participants of respondents 17.5% of them were female. The result shows that as expected more female household headed are participated in the program and is statically significant at 1% probability level.

Marital status: The marital status of the respondents, as it is tabulated below, indicates about 96.7% of them were married, 2.82% of them divorced/widowed and the remaining 1.02% was single. The result revealed that from the total respondents 96.6% were married while the remaining 3.4% were single, divorced or widowed; this showed that married PSNP participants are more than others. If we see the percentage within the PSNP itself, out of 108 women respondents, about 4.6% of the respondents were divorced or widowed.

Access to irrigation service: From the total sample households, 30.46 % of them had an access to irrigation service. This result indicates that as sampled households in both groups the access to irrigation was very low. As stated in Table 4, the analysis shows that, from that total access of irrigation participant households had better access than non-participant with 38.3% of participant and 23% of non-participant sampled households which is statistically insignificant with chi2 test of p-value = 0.674.

Credit service: From Table 4, access to credit for participant is better than non-participants which are about 51.97% and 32.25%, respectively. The result showed in Table 4 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, 50.7 % of them had an access to aid per a year. Around 59.8 % of the PSNP participant households had access to aid, while 43.3% of non- participant households had access to aid. The result indicated that there is a significant difference in access to food aid of households with chi² test of p-value =0.001 at 1% level of significance between the two groups.

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 counter parts. With regards to this pre-intervention variable, the null hypothesis is accepted.

Access to extension service: From the total sample households, 62.6 % of them had an access to extension service per a year. As stated in Table 4, the analysis shows that non-participant households had better access to extension service than participant with 65.89% of non-participant and 58.75% of participant sample households were visited by development agents (DAs) at all in the year 2019, which is statistically significant with chi² test of p-value of = 0.045.

Technology usage: As indicated in Table 4, below from the total sampled household's technology usage share 81.47% and the rest 18.53% were shares no technology usage practice per a year of 2019. Technology usage for participant and non-participants was about 80.7% and 82%, respectively. The result showed in

Table 5 indicated that there is insignificant difference between the two groups, with the chi2 test of p-value of = 0.753.

Table 3. Description of some socio-economic variables used under the study

Frequen								
Variable	Response	PSNP	%	Non-PSNP	%	Total	Percent	chi ² -test
Sex of household	Female	70	39.54	38	17.5	108	27.4	0.000
	Male	107	60.46	179	82.5	286	72.6	
Marital status	Single	0	0	4	1.8	4	1.02	0.103
	Married	170	96.04	211	97.2	381	96.7	
	Widowed	5	2.8	2	0.9	7	1.8	
	Divorced	2	1.1	0	0	2	0.5	
Irrigation access	Yes	52	29.3	68	31.3	120	30.4	0.674
	No	125	70.6	149	68.6	274	69.6	
Technology usage	Yes	143	80.6	178	82.02	321	81.47	0.753
	No	34	19.2	39	17.9	77	18.53	
Credit access	Yes	92	51.97	70	32.25	162	41.1	0.000
	No	85	48.02	147	67.7	232	58.8	
Extension access	Yes	104	58.75	143	65.89	247	62.6	0.045
	No	73	41.24	74	34.1	147	37.3	
Food aid access	Yes	106	59.88	94	43.31	200	50.7	0.001
	No	71	40.11	123	56.68	194	49.3	

Source: Own computation result.

4.4 Descriptive Statistics of Outcome Variables

Households total annual income: Table 5, presents descriptive statistics result of sample households based on their annual income, children schooling expense and as well as asset holdings in terms of Tropical Livestock Unit (TLU). The 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 30198.6 per households while, the mean total annual income of non-participants was birr 29464, which was statistically significant at 5%.

Livestock holding size (TLU): 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 3.2 in TLU. 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 -.0194634; its t-test also showed that this difference was statistically significant (p-value = -0.019) at 5% probability level.

The PSNP participant households, as a result of PSNP intervention, have seemingly not increased their livestock holdings. Thus, the program did not enable them to hold (increase) their livestock holdings. This indicates that, beneficiary households in the study area may use income from PSNP and other sources mainly for consumption smoothing purpose than productive asset accumulation (livestock). Despite, increasing livestock holding at household level is the main goal of the productive

safety net program. So that, asset ownership particularly the amount of livestock owned was the prime indicator for graduation. To this end, the beneficiary households` were not interested to hold productive assets in terms of livestock.

Children schooling expense: The sample households to annual children schooling expense on average spent ETB 1631.028 with a standard deviation of 1095.15 while this figure was 1700.282 ETB with standard deviation of 1182.166 for participant households and 1574.539 ETB with standard deviation of 1017.9 for non-participant households. The statistical analysis revealed that the mean difference between the two groups in relation to children schooling expense was 125.7; it is statistically insignificant at of P-value=0.257 significant level.

Table 4. *Description of some continuous (Outcome) variables used under study*

Variable	PSNP		Non-PSNP		Total	
Dev.	Mean	Std.	Mean	Std. Dev.	Mean	Std. Dev.
Income	31098.59	10340.92	29464.63	8022.722	30198.67	9161.181
TLU holding	3.300339	1.470293	3.280876	1.30443	3.289619	1.379643
Eduexpens	1700.282	1182.166	1574.539	1017.992	1631.028	1095.15

Source: Own computation result.

4.5 Econometric Analysis

This section describes the result from econometric analysis. It is divided into two sections. The first section explains econometric analysis which was followed to identify the impact of PSNP on selected livelihood of households. The second section presents the estimation of propensity scores, defining common support region, choosing matching algorithm, testing matching quality, calculating average treatment effect on treated and sensitivity analysis. The result of multicollinearity and model specification tests and the result of binary logit model to identify determinant factors that influence rural households' participation in the PSNP.

4.5.1 Estimation of Propensity scores

This part presents the results of the logistic regression model employed to estimate propensity scores for matching treatment household with control households. As specified earlier, the dependent variable in this model is binary indicating whether the household was a participant in the PSNP which takes a value of 1 and 0 otherwise. The model is estimated using STATA 13 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.

Below in Table 6 logistic regression output results, presents 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 regress and models, the pseudo- R^2 indicates how well the repressors explain the probability of participation. Hence, the pseudo- R^2 value of 0.2696, in the logistic regression, shows that the explanatory power of the matching variables is fairly low even before matching.

4.5.2 Factors that determine households' probability of participation in the PSNP

The estimated logistic regression model indicated that program participation was significantly influenced by 8 of the 12 explanatory variables used in the propensity score logistic estimation model. These include 8 of household head, sex of head, access of food aid, education level, farm land size, farm income, dependency ratio, credit access and agricultural extension service.

Of the eight variables, four had negative signs and the remaining four had positive signs. In understanding the determinants of participation in PSNP logistic regression was used. As we can see in the table below from all explanatory variables, sex of household head, education level of household head, age dependency ratio, farm land size of the household head, farm income of household head, access of credit, and access of food aid are found to be significant at 1% significance level and agricultural extension is significant at 5% significant level. Other covariates are found to be insignificant in the model.

Looking into output of logistic regression (Table 6), it was found that dependency ratio of sampled household affect households' probability of participation in PSNP positively and significantly at 1% significance level. The odds ratio of dependency ratio indicates that, a one unit increase in dependency ratio, keeping all other factors constant, increases the households' probability of participation by 17%.

The possible reason for this may be, household with larger inactive labour family size requires more food source or income to cover different costs associated with different demand arise from this large inactive labour family size. They have more family burden to contain with, in terms of social and economic services and therefore need kinds or financial support or interventions to meet their family daily needs.

From institutional service characteristics variables, agricultural extension service from DAs to household, affects the participation of households at 1% significant level with expected positive sign. It is statistically significant and determining factor for probability of PSNP participation.

This is because the higher extension contact with development agent causes better understanding of food security condition and income status of household, since they are members of community task force (CFSTF), this is may be advance households to a high probability of being included in PSNP.

From socio-economic characteristic variables, farm income of the household has negative relationship with probability of participation and statistically significant at 1% level of significance; hence inline to finding of Bigsten and Abebe (2003). The odd ratio of logistic result of farm income indicate that, increase a one unit of farm income, keeping all other factors constant, decrease the households' probability of participation by 0.7 units.

Farmers having large farm income indicate that, they produce more food and were not included in the program. Other variables which determining probability of PSNP participation significantly at 1% significant level with positive relationship are access to food aid, and sex of household head. A families or households have gotten aid frequently has a higher tendency of participating in Governmental and Non-governmental poverty reduction programs. The negative term of landholding 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.

According to Table 6 education levels of household head and farm land size have negative relationship with probability of PSNP participation and are statistically significant at 1% level of significance. The odd ratio of logistic results of farm land size and education level of household head indicate that, increase a one unit of both farm land size and education level of household head, keeping all other factors constant, decrease the households' probability of participation by 0.237 and 0.748 units respectively.

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 and did not participate to the intervention of PSNP. 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 negatively as expected sign at 1% significant level; and this is in line to finding of Ganta (2011).

It is expected that those who have got enough credit to buy inputs for their farm can easily be food secured and they have more income than those who did not participate in the program. 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 5. *Logit results of household program participation*

Parcpn	Odds Ratio	Coef.	Robust		
			Std. Err.	Z	P>z
Sexhead	2.704891	.9950616	.2757389	3.61	0.000***
Agehead	1.019469	.0192823	.0177486	1.09	0.277
Maritals	4.721791	1.552188	.9963592	1.56	0.119

Eduhead	.7487612	-.2893351	.050296	-5.75	0.000***
Depratio	1.017443	.0172923	.005493	3.15	0.002***
Farmlnd	.2377501	-1.436535	.4164882	-3.45	0.001***
Farmincm	.9999704	-.0000296	.000011	-2.70	0.007***
Irracc	.427188	-.3557062	.2700736	-1.32	0.188
Tecnacc	1.156131	.1450789	.3026004	0.48	0.632
Agrexstnsn	1.698105	.529513	.2579946	2.05	0.040***
Creditacc	.3562986	-1.031986	.2526484	-4.08	0.000***
Foodaid	.4806674	.7325796	.2501246	2.93	0.003***
_cons	.3562838	-1.032028	2.357749	-0.44	0.662

Note: Sample size (N) =394 Pseudo R² = 0.2696, Wald chi² (12) = 104.19, Prob > chi² =0.000 Log likelihood = -198.96615

Source: Own computation result.

4.5.3 Matching PSNP Participants with Non- Participant Households

There are three tasks that should be done before matching participant households with non-participant households. Estimating propensity score based on identified explanatory variable for all sampled households is the first task, which was done in previous section. Imposing common support condition on the propensity score distribution of households with and without participation is the second task. Discarding observations whose propensity score is outside common support region is the final task.

As shown in Table 7, the propensity scores vary between 0.1128615 and 0.9999833 for PSNP participants with mean score of 0.62. Whereas the score vary between 0.0015364 and 0.9999833for non-participant household with mean score of 0.306. The common support then lies between 0.0015364 and 0.9999833. This means that household whose propensity score less than minimum (0.1128615) and larger than maximum (0.9999833) are not considered for matching purpose. Accordingly, 12 households from the treatment group were dropped from analysis of average treatment effects.

Table 6. Distribution of estimated propensity score of households

Group	Observation	Mean	STD	Min	Max
All households	394	0.4492386	0.283072	0.0015364	0.9999833
PSNP participants	177	0.6242266	0.235996	0.1128615	0.9999833
Non-participant households	217	0.3065064	0.234206	0.0015364	0.9999833

Source: Own computation result.

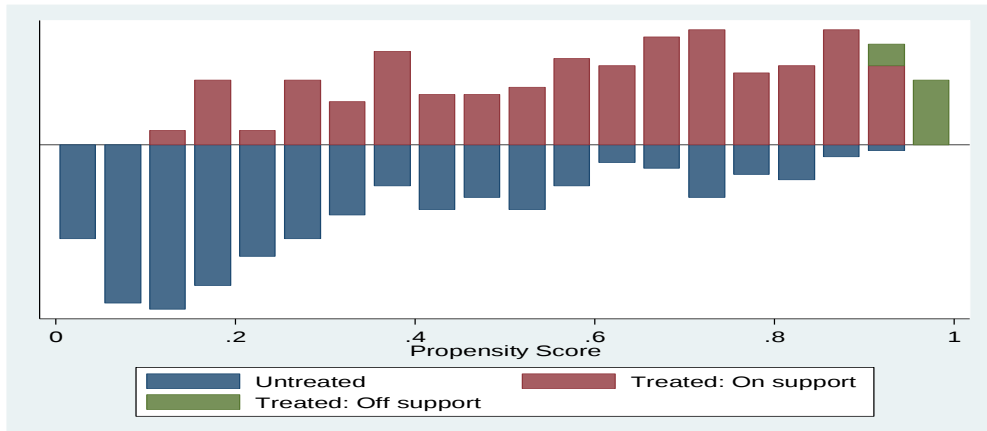
4.5.4 Distributions of propensity score in the common support region

The bottom halves of the histogram in the figure below shows the propensity score distribution of non-participant households and the upper halves shows the propensity score distribution of PSNP participant households. The red colored (treated on support) and the blue colored (untreated on support) indicates the observations in the

remittance recipient group and non-participant group that have suitable comparison respectively, whereas the green colored (treated off support) indicates the observations in the participant group that do not have suitable comparison.

Figure 2 below 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 2. Distribution of propensity score in the common support region



Source: Own computation result.

4.5.5 Matching Algorithm

Once the common support region identified, the next step is searching the appropriate matching algorithms. The appropriate matching algorithm were selected by observing three criteria in the result that are: the balancing test, the reduction in standard, pseudo- R^2 and matched sample size is preferable (Deheja and Wahba, 2002).

A matching algorithm which balances the most explanatory variables, results in a low pseudo- R^2 value, reduces more standard bias and also results in large matched sample size should be selected. As we see from Table 8, the Caliper radius matching algorithm (band 0.1) was found appropriate matching algorithm for the data presented for this study. Therefore, impact analysis procedure was followed and discussed by using Caliper radius matching of 0.1 levels.

As can be seen from Table 9, Caliper radius with band of 0.1 estimators have resulted in the lowest pseudo value, well balanced covariates and largest sample size from the sample. Hence, only the results obtained from this estimator were presented and discussed.

Table 7. Performance criteria of matching algorithms

Matching algorithms	Performance criteria			
	Covariates test*	PseudoR ²	Matched size Q	sample
Nearest neighbor				
1 neighbor	11	0.039	376	
2 neighbor	11	0.032	376	
3 neighbor	11	0.033	376	
4 neighbor	11	0.033	376	
5 neighbor	11	0.031	376	
Caliper radius				
0.01	11	0.028	348	
0.1	12	0.010	376 *	
0.25	11	0.033	376	
0.5	9	0.113	376	
Kernel				
0.01	11	0.032	348	
0.1	11	0.026	376	
0.25	11	0.027	376	
0.5	10	0.63	376	

Source: Own computation result.

4.5.6 Testing of balance of propensity score and covariates

After selecting best performing matching algorithm which satisfies prior identified performance criteria, balance of propensity score and explanatory variables was checked by the selected matching algorithm (Caliper radius with band of 0.1 in this case).

Table 8. Balancing test results of covariates using caliper radius band matching estimator

Covariates	Sample	Mean		%of bias % bias		T-value
		Treated	Control	reduction		
Sexhead	Unmatched	1.3955	1.1751	50.2		0.000
	Matched	1.3648	1.2619	23.4	53.3	0.307
Agehead	Unmatched	45.288	42.774	35.0		0.001
	Matched	44.881	44.83	0.7	98.0	0.550
Maritals	Unmatched	2.0791	1.9908	35.0		0.030
	Matched	2.0126	2.0352	-5.4	74.4	0.364
Educhead	Unmatched	5.8418	7.8249	-76.4		0.000
	Matched	6.1006	6.1521	-2.0	97.4	0.877
depratio	Unmatched	28.586	20.842	36.6		0.000
	Matched	27.614	28.723	-5.2	85.7	0.934
Farmlnd	Unmatched	0.31570	0.53111	-46.9		0.000
	Matched	0.3978	0.36699	10.2	78.2	0.695

Irracc	Unmatched	1.791	1.6866	23.9		0.675
	Matched	1.7799	1.7929	-3.0	87.5	0.745
Tecnacc	Unmatched	1.1921	1.1797	3.2		0.754
	Matched	1.1887	1.2267	-9.8	-207.8	0.662
Agrexstnsn	Unmatched	1.1977	1.1475	13.3		0.146
	Matched	1.1761	1.1166	15.7	-18.4	0.640
Creditacc	Unmatched	1.8023	1.8065	-1.1		0.000
	Matched	1.8239	1.8281	-1.1	-0.4	0.369
Foodaid	Unmatched	1.1412	1.6866	-132.6		0.001
	Matched	1.1572	1.1684	-2.7	98.0	0.844

Source: Own computation result.

As indicated in Table 9, above, 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.

It is clear that the main intention of estimating propensity score is not to get a precise prediction of selection into treatment. Rather, to balance the distributions of relevant variables in both groups (Caliendo and Kopeinig, 2008). Therefore, the selected matching algorithm, caliper radius band 0.1, has created a covariate balance between participant and non-participant households, which is important to conduct impact analysis.

The result in Table 10 below indicated that after matching the value of pseudo R^2 reduced from 0.269 to 0.010, the likelihood ratio reduced from 145.60 to 4.79 and chi2 test resulted insignificant (see Table 11).

Therefore, the result revealed that both treated and control groups had an identical distribution in the covariates after matching and the impact of PNSP could be easily evaluated since participants and non-participants were similar in their pre-intervention observable characteristics.

This low pseudo- R^2 value and the insignificant likelihood ratio test indicate that PNSP participant households and non-participant households had the same distribution in the covariates after matching.

Hence, these results can be used to assess the impact of PNSP among groups of households having similar observed characteristics. This enables to compare observed outcomes for participants with those of a non-participant group sharing a common support.

Table 9. Chi-square test for the joint significance of variables

Sample	Pseudo R ²	LRch ²	P>chi ²	Mean Bias	Med Bias	B	R	%Var
Unmatched	0.269	145.60	0.000	33.8	35.8	128.3*	1.13	33
Matched	0.010	4.79	0.965	5.1	4.5	24.1	1.00	17

Source: Own computation result.

All of the above tests suggest that the matching algorithm chosen was relatively best for the data of this study. Therefore, it was possible to proceed to estimate the average treatment effect on the treated (ATT) for the sample households.

4.5.7 Average Treatment effect on Treated (ATT)

Below here is discussed the impact of PSNP on annual household income, on livestock holding in (TLU), on children schooling expense and monthly food and non-food consumption expenditure (Monthly consumption expenditure). These were estimated by average treatment effect on treated (ATT) by the selected appropriate algorithm, caliper radius matching band of (0.1) and common support.

The impact of productive safety net program (PSNP) on annual household income, holding size of TLU and children schooling annual expense:

As Table 12 below shows, the estimated results of caliper radius matching with band of (0.1) of the average treatment effect on the treated (ATT), were revealed that, productive safety net program had a positive and significant impact on the outcome variables of annual income and children schooling expense except livestock holding.

The PSNP program participants:

The findings of the study revealed that, there are significant increments in mean, annual income and children schooling expense of program participants and significant decrement mean livestock holding in TLU as compared to the non-participants.

Participants' gains more mean annual income of Birr 4619 which is exceeds by 14.53% than the non- program participant households in this study area. This is significant at 1% of statistical significance level. This is consistence with the study conducted by Zoellick (2014), the finding indicates that PSNP has positive impact through preventing households from selling productive assets; facilitating new investment, income increase. The study concluded that participants of PSNP were built their financial asset of households more than non-participants household.

As indicated in PIM, asset ownership to productive safety net program participants, particularly the amount of livestock owned was the prime indicator for graduation or wealth ranking of beneficiaries. As the case of this study, participants Total Livestock holding in TLU is found to be less than from non-participants, by unit of 0.07319494 TLU which is about 22.5% non-program participants TLU were exceeds than the participants of PSNP as my study area. This showed there was a -

0.07319494 TLU unit negative difference between participant and non-participant as a result of PSNP participation. As indicated, asset ownership particularly the amount of livestock owned was the prime indicator for graduation. To this end, the participants did not need to hold productive asset as livestock as this study area.

Therefore, this result shows PSNP has a negative significant impact on livestock holding of participant households. This result was in line to finding of Habtamu (2011), Camilla Andersons *et al.*, (2009), Gillingal *et al.*, (2008), Wheeler *et al.*, (2010) and Tadele (2011). Those studies declared that the Productive safety net program had no brought statistically a significant positive impact on livestock holding.

As we can see from the time of the research recent researches indicates that the productive safety net program is playing a great role in improving the livelihoods of targeted households. This may because of that the changes in the implementation of the program in its program phases, but as we can see from the results of this study it is not similar with the results of recent studies. This may because of the mischief of the implementation modality and lack of proper implementations of other interventions beyond transfer to build productive assets. So that based on the survey conducted at the study area those productive asset accumulation interventions were not implemented as per the PIM.

In case of children schooling expense, participants were found to be more spending by Birr 403 which is about 23.1% greater than the non-program participants of the PSNP. As indicated in the Table 11, PSNP incurred more cost on children schooling than non-participants. PSNP participants spend on average 403 Birr per a year on children schooling than non-participants. The mean difference in children schooling expenditure was found statistically significant at 1% of significance level.

This shows that PSNP has brought positive and significant impact on children schooling. This result is consistent with the study conducted by Debela and Holden (2014); they concluded that PSNP has significant effect on capacitating PSNP participant parents to spend on more items such as exercise books, pens, clothes and others for their children as compared to non-participant households. In the same manner, the study conducted by Vuong (2012) supports the finding of this study.

The study concluded that PSNP improve human asset mainly through increased expenditure on children schooling. This finding is also supported by information obtained from key informant interview.

As we can see from the time of the recent researches indicates that the productive safety net program is playing a great role in improving the livelihoods of targeted households. This may because of that the changes in the implementation of the program in its program phases, but as we can see from the results of this study, it is not similar with the results of recent studies.

Table 10. Estimated ATT of annual household income, Livestock holding in TLU and children schooling expense.

Outcome variable	Sample	Treated	Controls	Difference	S.E.	T-stat
Total Annual Income	Unmatched ATT	31098.5876 31794.4848	29464.6313 27174.8845	1633.95623 4619.60039	925.371304 1189.6809	1.77 3.88**
Livestock holding in TLU	Unmatched ATT	3.30033903 3.25779879	3.28087561 3.30116366	0.019463418 -0.07319494	0.13990744 .183538997	0.14 -0.40*
Children schooling expense	Unmatched ATT	1700.2824 1739.1212	1574.539 1335.868	125.7433 403.2524	110.8785 145.8985	1.13 2.76**

Source: Own computation result.

This may be because of the mischief of the implementation modality and lack of proper implementations of other interventions beyond transfer to build productive assets. So that based on the survey conducted at the study area those productive asset accumulation interventions were not implemented as per the program implementation manual (PIM).

4.5.8 Sensitivity analysis

Deciding which variables should be included in a statistical model is one of the unsolved and probably most debatable issues in observational study. It is, of course, well known that relevant but omitted variables cause bias in outcome of intervention. The standard response to this knowledge has been to include additional control variables under the belief that the inclusion of every additional variable serves to reduce the potential threat from omitted variable bias.

However, reality is more complicated, and the control variable strategy does not protect from omitted variable bias (Kevin, 2006). To reduce this problem, sensitivity analysis has got a great attention on this day. Recently, it becomes an increasingly important topic in the applied impact evaluation literatures (Caliendo and Kopeinig, 2008).

In order to check for unobservable biases, using Rosenbaum Bounding approach sensitivity analysis was performed on the computed outcome variables with respect to deviation from the conditional independence assumption.

The basic question to be answered here is whether inference about treatment effects may be affected by unobserved factors (hidden bias). Based on this, sensitivity analysis was conducted for annual income of household, holding size of livestock in TLU and educational expenses of household as significant impact of PSNP was observed on these outcome variables.

Table 12, presents the critical level of $e^\gamma=1$ (first row), over which the causal inference of significant PSNP participation outcomes (impact) must be questioned. The first column of the table shows those outcome variables which bear statistical differences between PSNP participant and non-participant households in impact estimate. The rest of the values which correspond to each row of the significant outcome variables are p-critical values (or the upper bound of Wilcox on significance level -Sig+) at different critical value of e^γ .

The results show that inference for the impact of microcredit does not change, even though the participant and non-participant households were allowed to differ in their odds of being treated up to 200% ($e^\gamma=3$) in terms of unobserved covariates. That means for all outcome variables estimated, at various level of critical value of e^γ , the p- critical values are significant which further indicate that the study has considered important covariates that affected both participation and outcome variables. Thus, it is possible to conclude that impact estimates (ATT) of this study for each outcome variables was insensitive to unobserved selection bias.

Table 11. Result of sensitivity analysis by using Rosenbaum bounding approach

Outcomes	$e^\gamma=1$	$e^\gamma= 1.5$	$e^\gamma= 2$	$e^\gamma= 2.5$	$e^\gamma= 3$
Annual income	0	0	1.7e-15	9.2e-13	6.3e-11
Livestock holding	0	0	3.4e-12	1.8e-12	1.2e-10
Education expense	0	0	1.7e-15	9.1e-13	6.2e-11

Note: e^γ (Gamma) = log odds of differential due to unobserved factors where Wilcox on significance level for each significant outcome variable is calculated.

Source: Own computation result.

5. Summary, Conclusion and Recommendation

5.1 Summary

This study analyzed the impact of PSNP on the selected livelihood assets of rural households` and factors that determine program participation and outcome variables have been studied using a cross sectional data from four selected rural Kebeles out of fifteen rural Kebeles of rural farm household in Kadida Gamela Woreda, southern Ethiopia using data obtained from a sample of 117 program participants and 217 non-program participants with the total of 394 households. From the quasi-experimental approach, this study used the propensity score matching method to quantify the outcome variables of annual income, TLU and education expense gains to the participants of PSNP.

Multi stage sampling techniques were employed to select sample respondents. In the first stage, four *Kebeles* were selected randomly from all fifteen beneficiary *Kebeles*. In the second stage, within four selected *Kebeles*, households were stratified into two

strata (participant and non-participant in productive safety net program). Finally the primary data for this study was collected from 394 households from 177 program participants and 217 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.

Moreover, descriptive and inferential results indicated that mean differences between program participants and non-participants are statistically significant mean difference in terms of demographic characteristics like, age, sex, dependency ratio, and access to extension, access to credit food aid and land holding size of household heads.

The results of the Logit model also indicated that program participation is significantly influenced by a combination of factors. After matching participants in the PSNP with non-participants on the basis of some socioeconomic, demographic and other variables, the study found out that the level of annual income, livestock asset holding, and education expense of the PSNP participants; in 14.53% annual income of participant households were greater than non-participants and participant have more cost on children schooling than non-participants. PSNP participants spend on average 403.2524 Birr (23.1%) per year on children schooling than non-participants. This difference would suggest that the program is effective at increasing on annual income and educational expense of participant households.

5.2 Conclusion

In conclusion, the productive safety net program had negative effect as in-terms of livestock holding in the study area. The negative impact of PSNP on livestock holding obtained is might be because of households in the study area use the PSNP income mainly for consumption smoothing purpose than productive asset accumulation (livestock). Despite, increasing livestock holding at household level is the main goal of the productive safety net program. So that, asset ownership particularly the amount of livestock owned was the prime indicator for graduation.

To this end, the beneficiary households` were not interested to hold productive assets in terms of livestock. Generally the Productive Safety net program in the study area brought a positive impact on the program participant households` livelihood as expressed in terms of annual income and children schooling expense status of the beneficiary households, except livestock holding; that is negatively affected by the program.

5.3 Recommendations

The empirical results reported in this thesis led us to forward the following recommendations: Based on the findings of this study, the possible

recommendations which have important implications for enactment of livelihood asset improvements are forwarded.

From the results of the PSM model, farm land size, educational level of household head, and access to credit were found to have a negative relationship with households' probability of participating in the program. But rather, household head's irrigation access has shown a negative relationship with program participation, even if it's statistically insignificant. Therefore, governmental and non-governmental organizations should have to use as selection characteristics of clients; in order to meet the objectives of the program and livelihood asset enhancement strategies in the study area.

The results of the study showed that program participants are less encouraged to the farm income activities and awareness on agricultural technology usage practice than non-participant. Therefore, intervention measures should be incorporated in project planning for farm income activities and training on awareness of technology usage to improve livelihood of participant households.

This study found that PSNP participants are also, less encouraged in livestock holding and had not brought any positive and significant impact on the participants' productive asset accumulation, in-terms of livestock in the study area. This is because beneficiaries were used income mainly for consumption smoothing purpose than productive asset accumulation. Thus, program designers at higher levels, implementers at lower levels, and funding agents should re-evaluate the program design and implementation to bring the positive effect on the participants in terms of productive asset accumulation (livestock holding).

In the study area the result indicates that beneficiary's income from PSNP and other sources were mainly used in non-productive areas such as in food and non-food consumption, than investing in productive asset and saving; therefore it needs immediate measures to encourage beneficiary households to use their income investing on productive assets and to save. For example; rearing livestock, investing in non-farm and farming activities.

The result of impact evaluation shows that, some of the program participant households have high mean of total annual income than non-participant. Therefore, the responsible body should rank households' total level of income and assets and graduate households from the program to give chance to other poor and vulnerable households.

Finally, additional researches should be carried out using much larger sample size at different locations setting to acquire more empirical findings on the impact of PSNP on different participants' livelihood characters.

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