



ISSN 2278 – 0211 (Online)

## The Economic Impact of Productive Safety Net Program on Poverty: Evidence from Central Zone of Tigray National Regional State, Ethiopia

**Yibrah Hagos Gebresilassie**

(MSc), Department of Economics, College of Business and Economics  
Adigrat University, Ethiopia

### **Abstract:**

The government of Ethiopia launched Productive Safety Net Program in 2005 realizing the magnitude and severity of poverty. This paper aims at evaluating the impact of productive safety net program on poverty in Central zone of Tigray National Regional State, Ethiopia using primary data from randomly selected 600 rural households. Propensity Score Matching and Foster-Greer-Thorbecke (poverty measures) were used to evaluate impact of the program and poverty, respectively. This study indicated that the Program has positive and significant effect on consumption, livestock holdings, and productive assets. Moreover, the results indicated that the impact of the program on household total consumption expenditure per adult equivalent was found to be positive and significant. Statistically, this was found to be significant at 1 percent level of significance. Total poverty line and food poverty line were computed to be 330 and 235 Birr per month per adult equivalent, respectively. Using total poverty line, poverty rate was lowest among program participants (30.33%) than non-participants (31.1%). Highest poverty rate was found among respondents in households headed by women (38.42%) while households headed by men (23.1%). In conclusion, findings of this study revealed that the program has positive and statistically significant effect on poverty reduction through increasing household consumption expenditure per adult equivalent and protecting productive assets. Finally, it was recommended that female headed program participants based programs should be provided to help boost their agricultural output, and reduce endemic poverty.

**JEL: O12, O30, & R11**

**Key words:** Asset, Consumption per adult equivalent, Productive Safety Net Program, Program, Propensity Score Matching, Poverty, Tigray.

### **1. Introduction**

In recent times, the global focus has been on food security and poverty alleviation. This is being made in response to the increasing food insecurity and poverty in the world. The incidence of food insecurity and poverty is devastating particularly in the developing countries and in terms of food insecurity; 852 million people worldwide are still chronically underfed. In Africa, an estimated 200 million (27.4 percent) people are famished (Babatunde *et al.*, 2007). Eradicating extreme poverty and hunger is the first MDGs set by UN; this goal also has become the core development objective and agenda of the government of Ethiopia. The Plan for Accelerated and Sustained Development to End Poverty is Ethiopia's "guiding strategic framework". The key goal of PASDEP is to enable chronically food insecure households to acquire sufficient assets and generate income to move out of food insecurity and improve their resilience to shocks. Similarly, the main focus of the government's agricultural development strategy is to ensure self-sufficiency in food production at household level (ERSFE, 2009). Drought, environmental degradation, population pressure, limited access to services, shortage of farmland, lack of productive assets, low input and subsistence agricultural practices are the most prominent causes of food insecurity problems in rural areas of Ethiopia. As a result, more than 38 percent of the rural households fall below the food poverty line and 15 percent of the rural population in Ethiopia reported that they experience a food gap of greater than four months (MoARD, 2009). Realizing the magnitude and severity of the food insecurity, and linked to the PASDEP, the government of Ethiopia launched a development strategy known as Productive Safety Net Program (PSNP) in 2005. The program is the largest social protection scheme in Africa outside of South Africa's social grants schemes. The PSNP delivers social transfers to chronically food insecure households, either through public work activities or as a direct support with three distinct objectives of smoothing food consumption, protecting household assets and building community assets (Devereux and Guenther, 2009).

PSNP replaced the emergency humanitarian appeal system as a chief instrument. The program initially assisted about 5 million chronically food-insecure people in rural Ethiopia in about 262 chronically food insecure woredas (Districts) were targeted in the year 2005 which was scaled up to reach 8 million in 2006. The mode of payment was food and/or cash (Samuel, 2006; MoARD, 2004, and Ethiopia PSNP, 2006). The program has been established to alleviate food insecurity. It is a formal program meant to benefit individuals and households who are chronically food insecure, unable to work, or experience temporary decline in purchasing power by providing them with income or a substitute for income. Such programs include cash and in-kind transfer programs, subsidies, and labor-intensive public works (Nigussa and Mberengwa, 2009). The program is planned to be implemented for five years, at the end of which program participants who have received predictable transfers and complementary interventions throughout the program period will be expected to graduate out of dependence on external support, except during food crises (Ethiopia PSNP, 2006).

Tigray is one of the most drought prone and food insecure regions affected by recurrent drought and food security problems in the country. Most of the rural people in the region live in conditions of chronic hunger (Devereux and Sussex, 2000 cited in Gebrehiwot, 2008). Productive Safety Net Program is intended to protect the poorest section of the society or those who, as a result of shocks, find themselves temporarily below a given welfare level. Based on the national Productive Safety Net Program, the regional government has adopted the program with the purpose to help bridge the income gap of chronically food insecure households. About 1, 453,707 rural inhabitants in 31 woredas have been identified as target for both public work and direct support. Out of the total program beneficiaries (users) 1,294,062 are of the public work PSNP beneficiaries and the rest 159,645 are direct support beneficiaries (TFSCO, 2008). Central zone, where the study was conducted, selected mainly due to PSNP implantation. The total program participants of the study area were 300,577 of which 230, 535 were male public work PSNP participants while the rest were female public work PSNP participants. Out of the total PSNP participants 25,695 are direct support PSNP beneficiaries (users) of this 17,215 were male headed households while the remaining were female headed households (BoARD, 2009). Thus, the study attempted to review empirical evidences and to examine the economic impact of Productive Safety Net Program on poverty in central zone of Tigray National Regional State, Ethiopia.

## 2. Statement of the Problem

Realizing the magnitude and severity of the food insecurity, the government of Ethiopia has developed a Productive Safety Net Program under Food Security Program with the objectives of smoothing food consumption, protecting household assets and building community assets (Gilligan *et al.*, 2008). This program targets households that are vulnerable to environmental and other induced situations such as variability in rainfall. Approximately 8.5 million people, 10 percent of Ethiopia's population are chronically food insecure. These households' survival mechanism during unfortunate situation is known on mining of their already limited capital and assets. The mining of assets occur when families take last resort actions such as selling of productive assets, household goods or taking children out of school in order to survive, which as a result increases their vulnerability to future shocks and exacerbates their poverty. These survival strategies result in long-term negative impacts (Barnes, 2008). Studies indicate that Social Safety Net Programs have a significant effect on reducing income poverty. Assessment of Ethiopia's PSNP shows that 75 percent of PSNP beneficiary households consumed a greater quantity and quality of food and was more likely to retain their own food production for household consumption and less likely to sell assets in order to buy food (Devereux *et al.*, 2006 and Rachel *et al.*, 2006). Gilligan *et al.* (2008) found that positive and statistically significant effect of the program relative to the non-participants, program participants are more likely to be food secure. In addition to this, a study in some other countries like Indonesia indicates that the impact of participation in the Social Safety Net Programs on household consumption is found to be generally positive (Sumarto *et al.*, 2005). In Colombia, participation in the Familias en Accion<sup>1</sup> program increased food consumption by 15 percent compared to the previous year (Ayala and Endara, 2005). Similarly, Progresas<sup>2</sup> beneficiary families in Mexico increased their food expenditure by 33.33 percent more than non- participants did and in South Africa, the poverty gap has been reduced by 47 percent (Samson *et al.*, 2007). However, some studies from Ethiopia have indicated that program participants did not experience faster asset growth (Gilligan *et al.*, 2008). Andersson *et al.* (2009) indicated that there was no increment in livestock holdings for program participants. In the same way, a study by Nigussa and Mberengwa (2009) indicates that program participants possess very low asset holdings and most of them are very poor quality. PSNP does not have positive impact on household assets and households consumption. The finding strongly indicates that program participants still remain poor, and the high magnitude of poverty of the respondents and the community as a whole. Thus, empirical results from Ethiopia and other areas show paradoxical and conflicting results on the impacts of the program. Moreover, some of these studies used qualitative analysis (Barnes, 2008 and Rachel *et al.*, 2006). Very few studies evaluated the impact of the PSNP at national level were at early stage (eighteen months) of program implementation (Gilligan *et al.*, 2008) using similar methodology to the one considered in this study. Thus, the researcher believes that eighteen months of program impact evaluation might not be enough to evaluate the impact of a program (such as PSNP). A survey regarding the impact of PSNP on poverty has not been yet evaluated, and remains untouched in the study areas. To the level of the researcher effort, no studies have been carried out to evaluate systematically the impacts of the PSNP in central zone of Tigray National Regional State where this study was conducted.

<sup>1</sup> Familias en Accion program is a conditional cash transfer program in Bangladesh used as a means of poverty reduction strategy

<sup>2</sup> Progresas is a social assistance program in Mexico

### 3. Objectives of the Study

The overall objective of this study is to evaluate the impact of Productive Safety Net Program on poverty. More specifically:

- To examine the impact of Productive Safety Net Program on consumption
- To examine the differentiated effect of the program on men and women
- To assess the magnitude of depth, gap and severity of poverty differentials between program participants and non-participants

### 4. Empirical Literature

#### 4.1. Impact of Social Safety Net Programs on Assets and Consumption

Households can smoothen consumption by borrowing and saving, accumulating and depleting assets, adjusting labor supply (including that of their children), and being employed formal and informal risk-sharing arrangements (Morduch, 1995). The absence of efficient market-based or government provided consumption-smoothening instruments often results in the use of costly informal coping mechanisms once the adverse income shock hits, such as pulling children out of school, reducing nutritional intake, or selling productive assets.

Social Safety Net Programs in Indonesia were intended to help protect the traditionally poor as well as those newly poor due to crisis. The impact on the consumption from household participation in the Social Safety Net Programs was generally found to be positive and statistically significant. This implies that participation in the Social Safety Net Programs was broadly contributing to households securing a higher consumption level. The result of the Indonesian Social Safety Net Programs indicated that participation in the Program was consistent with a 4 to 10 percent higher per capita consumption level compared to that of a household with similar characteristics but which did not participate in the program (Sumarto *et al.*, 2005). According to Safriansyah (2008), the performance of Social Safety Net Programs found to play an important role in helping many of Indonesian households facing the hardship of the economic downturn during the 1997 crisis. The program helped in reducing the number of poor people across the country; poverty rates declined slightly from 17.4 to 15.5 percent over the three year period (from late 1997 to late 2000). Household's participation in this program increased their per capita consumption.

Colombia's Familias en Accion (FA) is a conditional cash transfer program. It was first designed and implemented in order to mitigate the effect of the economic downturn in the late 1990's on the consumption and wellbeing of poor households, with the objective of preserving the accumulation of human capital formation in poor families by providing cash transfers. According to the impact evaluation result of Attanasio and Mesnard (2006), the Program has demonstrated significant positive results, particularly in rural areas. Some of the principal results were an increase in household consumption of 9 percent with a nearly equivalent increase in food consumption, improvement in nutritional status of young children and an increase in school attendance. It is likely that total consumption of the program participant households in Colombia have been increased. The program increased total household consumption very considerably, 19.5 percent in the rural areas (Attanasio and Mesnard, 2006). Few studies (Devereux *et al.*, 2006; Gilligan *et al.*, 2008; Nigussa and Mberengwa 2009) have been conducted so far at national level and to some extent at woreda level, but these are limited in scope and coverage. Rachel *et al.* (2006), who used qualitative research study, indicated that the Ethiopia's Productive Safety Net Program is already having a positive and significant impact. There is clear evidence that several important changes have taken place. In terms of food consumption, the program participants are commonly consuming more food, of different types, of better quality, and more often than non-participants. Significant numbers of program participants were able to avoid selling food to pay for short-term household needs such as medicine or school fees. The program participants have been able to avoid selling of productive assets like livestock because the program has enabled the program participants to protect their assets. The program is also being used for a range of productive investments including education, livestock and savings schemes where this program is implemented. The program 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. This indirectly enhances the asset building role of the PSNP. All of these patterns are found to a greater extent in households receiving cash from the PSNP, and consequently the range of consumption smoothening, asset protection and asset building was wider (Rachel *et al.*, 2006).

Devereux *et al.* (2006) has noted that 75 percent of program participants have been reported that they consumed more food of better quality of food and 60 percent of program participants avoided having to sell assets to buy food. Since one of the objectives of the PSNP is to protect households' assets, the results of study prove and indicate that program enables participants to protect their assets from selling during anxiety and approximately one-quarter of program participants acquired new assets for their households. He has also noted that the impact of the program on food consumption and assets protection to be positive and significant effect. In terms of assets protection, non-participants were more likely to experience falls in their asset-holding program participants and much of the asset depletion was attributed selling of livestock to buy food. On the other hand 62 percent of program participants reported being effectively protected against distress sales of assets for essential purchases, while 23 percent even increased their asset ownership over the year. Similarly, a study conducted by Gebrehiwot (2008) also indicated that PSNP is having a significant positive impact in improving the food security of program participants and in helping to protect their assets in Tigray region. The program has enabled the poor to engage in livelihood strategies that offer the potential for pathways out of poverty, by providing risk mitigating opportunities and selecting community projects such as soil and water conservation activities that will enhance food production and reduce vulnerability to drought, thereby steadily reducing the numbers of people who are dependent on food aid. In the same way

Barnes (2008) has noted that the program has stabilized and greatly improved the lives of millions of people in Ethiopia. As intended, community assets are being built, livelihoods are being protected and improved and the normal annual food gap has been filled.

Another study conducted by Gilligan *et al.* (2008), that implemented PSM to assess the impact of Ethiopia's PSNP found it to have positive and statistically significant effect of the PSNP. Relative to the non- participants, program participants are more likely to be food secure, and are more likely to borrow for productive purpose, use improved agricultural technologies, and operate non-farm own business activities. However, while asset levels grew, relative to the non- participants, program participants did not experience faster asset growth.

Nigussa and Mberengwa (2009) have evaluated the challenges Productive Safety Net Program and pointed out that program participants possess very low asset holdings and most of them are of very poor quality. The program did not have positive impact on household assets and consumption. The result of the study indicated that program participants remained poor, their domestic assets are limited and their estimated values are relatively low. The result of the study further revealed the prevalence of high magnitude of poverty of the respondents and the community as a whole. Andersson *et al.* (2009) indicated that there was no increment in livestock holding as a result of the program. Statistically, this was found to have insignificant impact on livestock holdings for program participants.

## 5. Methodology

### 5.1. Data Sources and Sampling Procedure

To attain the stated objectives, mainly primary data was used. The primary data collection methods employed includes both the use of structured and semi-structured type, focus group discussions and field observations to get in-depth information. Secondary data was also used to supplement the primary data using that was collected from various sources. A three-stage sampling procedure was implemented. In the first stage, the study area was selected based on PSNP coverage. In the second stage, five woredas (Districts) were selected randomly and finally, samples of 600 representative households were drawn on probability proportional to sample size. About 365 (60.8 percent) program participants and 235 (39.3 percent) non-participants were selected randomly using a systematic random sampling procedure.

### 5.2. Method of Data Analysis

The collected data were subject to both descriptive statistics and econometrics analysis such as Foster, Greer and Thorbecke (FGT) index and Propensity Score Matching (PSM) to measure poverty and impact of the Productive Safety Net Program (PSNP), respectively.

### 5.3. Impact Analysis

Choosing an appropriate model and analytical technique depends on the type of variable under consideration (Gebrehiwot, 2008). Here, the dependent variable of interest (program participation) is binary that takes a value of 1 and 0. Assessing the impact of any intervention requires making an inference about the outcomes that would have been observed for program participants had they not have participated. The appropriate evaluation of the impact of the program requires identifying the average treatment effect on the treated (ATT) defined as the difference in the outcome variables between the treated households and their counterfactual. Counterfactual refers to what would have happened to the outcome of program participants had they not have participated (Rosenbaum and Rubin, 1983; Becker, S., and Ichino, A. 2002 and Gilligan *et al.*, 2008). According to Rosenbaum and Rubin (1983), let  $Y^{PSNP}$  be the outcome of the PSNP participants and  $Y^{non-PSNP}$  outcome of the non-participants. For each household, only  $Y^{PSNP}$  or  $Y^{non-PSNP}$  is observed, which leads to a missing data problem. In estimating the propensity score, the dependent variable used was participation in the PSNP and Let  $D_i$  denotes the participation indicator equalling 1 with probability of  $\pi$  if the household is program participant and 0 with probability of  $1-\pi$  otherwise. Let  $X_i$  denotes a vector of observed individual characteristics used as conditioning variables. Propensity Score Matching (PSM) technique was used which looks like as follow:

$$ATT_{PSM} = E_{P(X)}\{E(Y^{PSNP} | D = 1, P(X)) - E(Y^{non-PSNP} | D = 1, P(X))\}$$

The perception is that two individual households with the same probability of participation will show up in the participants and non-participants samples in equal proportions on the basis of propensity scores.

### 5.4. Poverty Analysis

The poverty situation of the program participants and non-participants was analyzed using the expenditure approach, the one developed by Foster, Greer, and Thorbecke (1984) known as FGT Index which is commonly applied for poverty analysis. A separate food and total poverty lines were developed for the study area using the Cost of Basic-Need approach (CBN) as proposed by Revallion and Bidani (1994). The three measures of poverty in the FGT index were employed of which the Head Count Index ( $P_0$ ) which depicts number of population who are poor, Poverty Gap Index ( $P_1$ ) which measures the extent to which individuals fall below the poverty line (the poverty gaps) as a proportion of the poverty line and Poverty Severity Index ( $P_2$ ) that demonstrates not only the poverty gap but also the inequality among the poor (WBI, 2005). Let  $Z$  is the poverty line,  $Y_i$  is the actual expenditure (per adult equivalent) of individuals below the poverty line,  $n$  is number of people,  $q$  is the number of poor people normally those below the poverty threshold,  $\alpha$  is poverty aversion parameter and is a value given (0, 1, or 2) to determine the degree to which the measure is

sensitive to the degree of deprivation for these below the poverty line and higher values of  $\alpha$  shows greater weight is placed on the poorest section of the society.

Then, the FGT or  $P_\alpha$  is given by:

$$P_\alpha ( Z , Y ) = \frac{1}{n} \sum_{i=1}^q \left[ \frac{Z - Y_i}{Z} \right]^\alpha$$

Therefore, if the value of  $\alpha=0$ , the FGT or the  $P_\alpha$  becomes the Head Count Index ( $P_0$ ), when  $\alpha=1$ ,  $P_\alpha$  is the Poverty Gap Index ( $P_1$ ) and  $\alpha=2$ ,  $P_\alpha$  becomes the poverty severity index.

## 6. Results and Discussion

### 6.1. Impact of the Productive Safety Net Program

The impact indicators used in this study were assets and consumption expenditure. Consumption is here measured as per adult equivalent, which is food consumption per-adult equivalent, non-food consumption and total consumption expenditure (food and non-food) per-adult equivalent.

Out of the total sample respondents, 69 percent of them were male headed households and the remaining 31 percent female headed households whose livelihoods are based on farming activities. About 82 percent of the sample respondents were illiterate while 18 percent of them were literate. Male-headed households participate more relative to the female-headed households in the study area. Out of the total male-headed household respondents, 65 percent were from the PSNP participants. Only 35 percent of the female-headed households were PSNP participants out of the total female-headed sample. There was statistical significant mean percentage difference between male-headed and female-headed households in PSNP participation at less than 1 percent significance level  $\chi^2=15.35$  (P-value=0.000). This result was in line with the study done by Gilligan *et al.* (2008) whose findings on the PSNP which indicate that participants in the public work were more likely to come from male-headed households with married head. The study revealed that there were shocks resulted from famine, death of livestock, death of family members, crop loss and theft of livestock. Out of the total sample respondent households, 71 percent of program participants and 29 percent of the non- participants had experienced shocks. The mean percentage difference between program participants and the non- participants was statistically significant at less than 1 percent level of significance. Family size and program participation have positive relationship. On average, program participants (6) have a bit larger family size than non-participants (5). The combined average family size for sample respondents was six persons per household. The mean difference in family size between program participants and non-participants was statistically significant at 5 percent level of significance. The result revealed that households with higher male adults were participating more in the program than those who have less male adults. Thus, the mean difference of male adults between program participants and non- participants was positive. Statistically, this was found to be significant at less than 1 percent level of significance. About 98 percent of the program participants were not fully targeted in the program, this was mainly due to quota targeting system. This indicates that the program participants would have improved their livelihood had they fully been targeted by the program. The mean age of the sample household heads was found to be 49 years. The mean age of program participants and non-participants were 49 and 48 years, respectively. On average, the cultivated landholding size of the sample respondents was about 0.45 hectare. The average cultivated landholding size for program participants was 0.35 hectare whereas that of the non- participants was 0.38 hectare. Thus, the mean difference of the landholding between program participants and non- participants was found to be not statistically significant.

Livestock is an important component of the farming system in the study area. The average number of livestock owned by the sample respondents prior to the program intervention was converted into tropical livestock unit (TLU) and this was used as lagged variable in matching technique. On average, the sample respondents have had about 3.7 while the program participants and the non- participants have 3.5 and 3.3 TLU respectively with bootstrapped standard error. Prior to the program intervention, however, the mean difference in terms of TLU between the program participants and non- participants was found to be not statistically significant. Currently, on average, program participants and non-participants have 4.5 and 2.5 TLU, respectively. The result revealed that on average the TLU of the program participants have increased from 3.5 to 4.5 while that of the non- participants have decreased from 3.3 to 2.5. After program intervention, the average size of TLU for program participants has increased by one fold while that of the non-participants has declined by 0.8. Statistically, this was found to be significant. Oxen are important assets and were treated separately; on average the sample respondents have about 1 TLU. The mean oxen TLU for the program participants and non- participants were 1.16 and 0.67, respectively.

### 6.2. Econometric Analysis of Impact of the Program (PSNP)

To examine the impact of PSNP, PSM technique was employed. Therefore, logistic regression model was used to estimate the propensity scores and the dependent variable used was a binary variable indicating 1 for participation in PSNP and 0 otherwise while estimating the propensity score. Stata software version 12.1 was used to analyze the data.

### 6.3. Econometric Analysis of Welfare Effects (Impact of PSNP on Assets)

#### 6.3.1. Impact on Livestock holdings

The average the TLU of the program participants has increased from 3.5 to 4.5 TLU while that of the non- participants have decreased 3.3 to 2.5 TLU. After program intervention, the average size of TLU for program participants has increased by one fold while that of the non- participants has declined by 0.8 TLU. The mean difference in terms of TLU between program participants and non- participants was found to be positive. Statistically, this was found to be significant at less than 1 percent level of significance based on the three matching estimators with bootstrapped standard errors.

#### 6.3.2. Impact on Productive Asset

All asset categories have been valued in Ethiopian Birr based on their current prices as reported by each sample respondents, but deflated. The result indicates that the value of the productive assets at their prices (but deflated) was higher for program participants than non- participants. The difference in the mean value of the productive assets between program participants and non- participants was positive and significant. Statistically, this was found to be significant at 5 percent significance level based on radius matching estimators and at 10 percent significance level using kernel, but it was found to be not statistically significant based on nearest neighbor matching estimators with bootstrapped standard error.

#### 6.3.3. Impact on Durable and Household Goods

The impact of the PSNP on the value of the durable goods was positive and statistically significant. This indicates that program participants were able to protect their durable goods as a result of the program's intervention. The mean value of the durable goods was found to be positive and significant. Statistically, this was found to be significant at 5 percent level of significance based on the three matching estimators with bootstrapped standard errors.

The impact of the PSNP on household goods was found to be positive and significant. Statistically, this was found to be significant at less than 1 percent level of significance based on the three matching estimators with bootstrapped standard errors. The mean difference was statistically significant at less than 1 percent significance level based on the three matching estimators with bootstrapped standard errors. The result of this study was similar to the findings of Devereux *et al.* (2006) who indicated that the impact of the program on assets protection has positive and significant effect. In terms of asset protection, non-participants were more likely to experience decrease in their asset-holding than program participants.

Outcome variables	Estimators	No. of PSNP participants	No. of non-PSNP participants	ATT	t-values
Livestock	Nearest Neighbor	332	123	1.966	3.490***
	Kernel	210	143	1.845	10.375***
	Radius	212	143	2.012	8.647***
Productive asset	Nearest Neighbor	218	123	31.397	1.031
	Kernel	218	143	35.609	1.661*
	Radius	218	143	38.324	2.357**
Durable goods	Nearest Neighbor	218	123	34.518	2.154**
	Kernel	218	143	36.075	2.329**
	Radius	218	143	33.882	2.059**
Household goods	Nearest Neighbor	218	123	89.321	3.627***
	Kernel	218	143	80.196	3.744***
	Radius	218	143	70.202	3.292***

Table 1: ATT Estimation Results of the Impact of Productive Safety Net Program on Assets

Source: Authors' Calculation from the Survey Data

Significant differences are indicated with: \*  $p < 0.05$  (5 percent level), \*\*  $p < 0.01$  (10 percent level), \*\*\*  $p < 0.001$  (1 percent level) and standard errors are bootstrapped.

#### 6.3.4. Impact of Productive Safety Net Program on Consumption

Consumption expenditure was used as impact indicator while evaluating impact of the program (PSNP), and it was computed as per adult equivalent consumption expenditure. Consumption expenditure is defined as the sum of values of all food items, including purchased meals, and nonfood items. Per adult equivalent consumption expenditure is defined as per capita consumption expenditure adjusted for age and gender of household members obtained by dividing the household consumption expenditure to adult equivalent.

#### 6.3.5 Impact on Consumption Expenditure

The result of this study revealed that on average, program participants consumed more food items (in terms of food value) as compared to the non-participants. The difference in the mean value of food consumption per adult equivalent between program

participants and the non- participants was found to be positive and significant. Statistically, this was found to be significant at less than 1 percent significance level based on the matching estimators used with bootstrapped standard error. Therefore, the overwhelming majority of program participants participating in the PSNP consumed more food items. The result of this study was similar to the study conducted by Gilligan *et al.* (2008) who found out that positive impact on per capita food expenditure and this was statistically significant. Thus, program participants were more likely to consume more food as compared to the non-participants. The estimated non-food household consumption expenditure per adult equivalent was positive. However; statistically, this was found to be not significant. Impact of the program was evaluated for total consumption (food and non-food). In this estimation, the total food and non-food consumption items of the respondents were used to obtain the total per adult equivalent consumption expenditure. Thus, the total per adult equivalent consumption expenditure for program participants was found to be higher as compared to that of the non-participants. The estimated results indicated that the mean total consumption per adult equivalent of program participants was significantly higher than that of the non- participants. Statistically, this was found to be significant at less than 1 percent level of significance based on the matching estimators with bootstrapped standard error. The principal results of the study on consumption expenditure shows that program intervention enables program participants to increase household consumption expenditure very considerably. The result of this study supports the result of study conducted by Devereux *et al.* (2006) who noted that 75 percent of program participants have been reported that they consumed more food of better quality. In the same way, the result of the study also coincides to the study conducted by Barnes (2008) who has noted the PSNP has positive and statistically significant impact on household consumption.

Outcome variable	Matching method	No of PSNP participants	No of PSNP non-participants	ATT	t-values
Food consumption	Nearest Neighbor	332	123	1254.59	6.960***
	Kernel	218	143	1061.25	8.144***
	Radius	218	143	1070.22	9.227***
Non-food consumption	Nearest Neighbor	218	123	9.50	0.127
	Kernel	218	143	30.98	0.620
	Radius	218	143	31.04	1.011
Total consumption	Nearest Neighbor	218	123	305.75	3.753***
	Kernel	218	143	242.72	4.072***
	Radius	218	143	241.50	5.303***

Table 2: ATT Estimation Results of Impact of PSNP on Household Consumption

Source: Authors' Calculation from the Survey Data

Significant differences are indicated with: \*  $p < 0.05$  (5 percent level), \*\*  $p < 0.01$  (10 percent level), \*\*\*  $p < 0.001$  (1 percent level) and standard errors are bootstrapped.

#### 6.4. Econometric Analysis of Poverty

Estimating the levels and changes in poverty requires prior task of setting a poverty line. Here, the researcher used a cost-of-basic-needs approach. Based on the 2010 collected data, a food poverty line is constructed using a bundle of food items that would provide 2,200 Kcals per adult per day. To this, the researcher has added a nonfood bundle using the method set out in Ravallion and Bidani (1994). Dercon and Krishnan (1996, 2000) provide further information on the construction of the poverty line, including the details of the food basket and its sensitivity to different sources of data on prices used to value the food basket. Household welfare is highly correlated with income. Household incomes are not easy to measure, because they are not always a true reflection of actual incomes, but household consumption expenditure is usually a reliable indicator. Individual expenditures have historically been shown to be correlated with income level. Household surveys have therefore traditionally captured data on expenditures as a proxy for estimating incomes. Consumption expenditure on a determined food basket was used to estimate the poverty line.

Therefore, the food poverty line is 235 per month or 2820 Ethiopian Birr per year per adult equivalent. Once the food poverty line is computed, the total poverty line was derived by taking the average food share of the first lower (first quartile) proportion of the population (WBI, 2005) which resulted in a total poverty line (TPL) of 330 per month or 3960 per year per adult equivalent Ethiopian Birr.

The most widely used poverty indices are the percentage of the poor or head count index ( $P_0$ ), the aggregate poverty gap or poverty gap index ( $P_1$ ) and the distribution of income among the poor, Poverty Severity Index ( $P_2$ ). The head count index measures the share of the population whose income or consumption is below the poverty line, that is, the share of the population that cannot afford to buy a basic basket of goods. The poverty gap index measures the extent of the poor (living below the poverty line) how far away from the poverty line and the poverty severity index measures not only the gap but also the inequality among the poor, that is, a higher weight is placed on those households further away from the poverty line.

#### 6.4.1. Total Poverty Line (TPL) and Food Poverty Line (TFPL)

The incidence of poverty was analyzed using the total poverty line (330 per month or 3960 per year per adult equivalent Ethiopian Birr) and then food poverty line of 235 per month or 2820 Ethiopian Birr per year per adult equivalent. Accordingly, 30.33 percent of the respondents were living below the poverty line with poverty gap index of 6.6 percent and poverty severity index of 2.77 percent. Ahferom (30.33 %) and Merebleke (25.55%), with poverty gap and severity index level (2% and 0.55%) and (1.85% and 0.45%) were the leading woredas (Districts) in this zone with their high and low level of poverty, respectively.

Woreda (District)	Poverty Estimates			Total Poverty line
	P <sub>0</sub>	P <sub>1</sub>	P <sub>2</sub>	
Geter Adwa	0.351(0.038)	0.052(0.009)	0.013(0.003)	330
Ahferom	0.313(0.031)	0.054(0.008)	0.016(0.003)	330
Kola Temben	0.346(0.036)	0.049(0.008)	0.013(0.003)	330
Merebleke	0.320(0.036)	0.025(0.009)	0.007(0.003)	330
Lailay Machew	0.308(0.042)	0.077(0.014)	0.029(0.008)	330
Population	0.328(0.008)	0.084(0.003)	0.031(0.001)	330

Table 3: Incidence of Poverty by Woreda (Districts)

Source: Authors' Calculation from the Survey Data, Values in brackets are standard deviations

There is a remarkable difference in the level of poverty across woredas (Districts) of the region. The three leading woredas having highest head count index were Endamekoni (56.7%), Tahtay Koraro(51.9%) and Ofla(50.4%). Moreover, the lowest level of poverty was observed in Asgede Tsimbla (10.7%), followed by Kiltawlaelo (21.3%) and Medebay zana (23.8%).

#### 6.4.2. Poverty and Gender of the Household

Most studies on poverty state that the probability of female headed households to fall into poverty is much greater than for households headed by male due to the factors like less educated in the population, cultural values, and ethnicity and lack of physical and human capital (Fitsum T., 2002, Mok T.Y, *et al*, 2007). Esubalew (2006) found similar result in his study in Deberemarkos. The probability that a household will be poor when headed by female is significant at 95 percent confidences interval. Therefore, the probability of female-headed one is more vulnerable to the prevalence of poverty than those of male headed ones. There was statistically significant difference on the level of poverty across gender at 5 percent level of significance. 30 percent of the female headed households were found to be below the poverty line with poverty gap index of 7.3 percent and severity index rate of 2.6 percent. Male headed households had 0.23 level of poverty head count index with poverty gap index of 0.062 and squared poverty gap index of 0.028. Thus, the incidence of poverty was higher in female headed households than their counter part.

Sex of the household head	Poverty Estimates			t-statistics
	P <sub>0</sub>	P <sub>1</sub>	P <sub>2</sub>	
Female	0.301(0.0021)	0.073(0.0051)	0.026(0.0023)	
Male	0.231(0.0076)	0.062(0.0025)	0.028(0.0011)	0.004***
Population	0.233(0.0046)	0.061(0.0031)	0.026(0.0010)	

Table 4: Incidence of Poverty by Gender

Source: Authors' Calculation from the Survey Data

\*\*\*Significant at 1% & values in parenthesis are standard deviation

#### 6.4.3. Poverty and Education

As most studies have indicated, education has positive and significant impact on poverty. Highest level of poverty of 35.55 percent (head count index) was observed in illiterate households; accompanied by high level of poverty gap index 9 percent and severity index of 1.65 percent.

#### 6.4.4. Poverty and Family Size

Significant numbers of research works carried out to express the relationship between poverty and family size revealed that there is an inverse relationship between households' size and that of poverty status of the household. A household who have a larger family size has the higher probability of falling into poverty (Ranjan R., 1999; Fitsum T., 2002; and Esubalew, 2006). The average family size of the sample respondents was 5.66 per household. Whereas the average family size of the program participants was 5.33 per household while that of the non-program participants was 4.85 per household.



The findings of the study show that as the family size of the household increases, the incidence of poverty also increases. About 6.3 percent of the households that have a family size of 2-3 were living below the poverty line with income short fall of 3 percent and poverty severity index of 1.1 percent. About 12.8 percent of the households with family size of 4-5 were living below the poverty line with poverty gap index of 4.12 percent and poverty severity index of 1.88 percent. Thus, as has been indicated by most empirical literatures, the level of poverty had increased directly with an increment of family size of the households.

#### 6.4.5. Poverty and Productive Safety Net Program

Based on the criteria set by the Ethiopian government, the rural households who were eligible (program participants) to the program 60.8 percent (n=365) were participating in Productive Safety net Program and the remaining 39.3 percent (n=235) were from the non-participants. The results of this study show that the poverty level of the program participants was lower than that of the non-participants. The results also indicated that 30.33 percent of the program participants and 31.11 percent of the non-participants were found to be living below the total poverty line. Furthermore, the poverty severity index was lower for the program participants.

Variable	Total Poverty Estimates TPL			Food Poverty Estimates FPL				
	P <sub>0</sub>	P <sub>1</sub>	P <sub>2</sub>	P <sub>0</sub>	P <sub>1</sub>	P <sub>2</sub>		
Participants	0.3033	0.066	0.025	330	0.370	0.045	0.021	235
Non-Participants	0.3110	0.059	0.022	330	0.391	0.051	0.026	235
Population	0.30615	0.0624	0.025	330	0.383	0.053	0.020	235
Pearson chi2(1) = 0.3432 Pr = 0.411 <sup>N</sup>				Pearson chi2(1) = 4.111 Pr = 0.015**				

Table 5: Level of Poverty by Program Participation

Source: Authors' Calculation from the Survey Data

\*\*Significant at 5% and N = non-significant

Based on the level of food poverty, there was statistically significant difference between the two groups (participants and non-participants). The head count indices were 0.37 and 0.191 for program participants and non-participant households, respectively. The poverty gap index was lower for the program participants (0.023) than that of the program non-participants (0.043). And the poverty severity of the program participants (0.012) was 1.9% lower than the non-participants (0.031).

#### 6.4.6. Food Poverty

About 235 Ethiopian Birr measured in per adult equivalent was used as food poverty line, accordingly, 30.6 percent of the households were found to be below the food poverty line with income gap of 6.24 percent and squared poverty gap index of 2.1 percent. As depicted in table 6 below, the level of food poverty incidence varied from Woreda (District) to Woreda (District). The highest food poverty head count index (0.217) was recorded in Geter Adwa and the least was observed in Tahitay Machew (0.111). In addition, the poverty gap (0.034) was higher in Geter Adwa and the least was observed in Mereb Leke (0.003).

Woreda	Food Poverty Estimates			Food Poverty Line
	P <sub>0</sub>	P <sub>1</sub>	P <sub>2</sub>	
Geter Adwa	0.217(0.031)	0.034(0.013)	0.012(0.002)	235
Ahferom	0.157(0.021)	0.015(0.004)	0.006(0.003)	235
Kola Temben	0.126(0.022)	0.014(0.004)	0.005(0.003)	235
Lailay Machew	0.134(0.030)	0.028(0.014)	0.011(0.011)	235
Mereb Leke	0.215(0.012)	0.003(0.002)	0.001(0.001)	235
Population	0.125(0.004)	0.024(0.001)	0.013(0.001)	235

Table 6: Food Poverty by Woreda Level

Source: Authors' Calculation from the Survey Data

## 7. Conclusion and Recommendations

### 7.1. Conclusion

It was found that Productive Safety Net Program (PSNP) intervention has enabled the program participants to retain their assets holdings. The program participants, as a result of the program's intervention, program participant have increased their livestock holdings and were also able to protect (increase) their assets holdings. The result of this study found that the mean difference of the livestock holdings, in terms of TLU, between the program participants and the non-participants was positive and significant.

Statistically, this was found to be significant at less than 1 percent level of significance. The program also has positive and statistically significant impact on productive assets, durable goods, and household goods. This study also examined the impact of the PSNP on household consumption expenditure. Positive and significant results were obtained for food consumption per adult equivalent and total consumption per adult equivalent. The result of this study revealed that the food and total per adult equivalent consumption expenditure for the program participants was higher as compared to that of the non-participants. Statistically, this was found to be significant at less than 1 percent level of significance based on nearest neighbor, kernel, and radius matching estimators and standard error was bootstrapped.

The incidence of poverty was analyzed using the total poverty line (330 per month or 3960 per year per adult equivalent Ethiopian Birr) and then food poverty line (235 per month or 2820 Ethiopian Birr per year per adult equivalent). Accordingly, 30.33 percent of the respondents were found to be below the poverty line with poverty gap index of 6.6 percent and poverty severity index of 2.77 percent. Based on the level of food poverty, there was statistically significant difference between the two groups (participants and non-participants). The head count indexes were 0.37 and 0.191 for program participants and non-participant households, respectively. The poverty gap index was lower for the program participants (0.023) than that of the program non-participants (0.043). And the poverty severity of the program participants (0.012) was 1.9% lower than the non-participants (0.031). Furthermore, the poverty severity index was lower for program participants. In conclusion, findings from this research revealed that impact of the Productive Safety Net Program (PSNP) has positive and significant effect on poverty reduction through increasing households' overall family consumption expenditure and in protecting assets of the rural households in the study areas, central zone of Tigray National Regional State, Ethiopia.

### 7.2. Recommendations

According to the findings of this research study, the program was found to have positive and significant impact on livestock holdings for program participants. Hence, the government should encourage the program participants to re-orient on commercialized dairy and fattening livestock development activities in order to reduce the problem of food insecurity and to improve their income sources.

The result of study also indicated that most of the program participants were not fully targeted into the program (PSNP). Therefore, all members of the program participants should be fully targeted into the program so that to improve their food insecurity problems and to ensure self-food sufficiency (the program should be individual focused than household based). The program was unable to target all the eligible ones in the study area. Thus, in order to target all the eligible ones the government should consider reducing the duration of benefits from the program (reducing the duration of program benefits) so as to increase the number of participants within the budget constraints. Thus, the researcher recommends reducing program participation period from five to four years with series follow ups. Results of this study indicate that most of the program participants are male-headed households relative to the female-headed households. Hence, the program should also include female-headed households at least in the same proportion as that of the male-headed households.

Finally the researcher suggested that periodic evaluation of the PSNP at national and regional level is absolutely essential. Such evaluation alone can throw light on what is working and what is not. This allows the government to reform and consolidate the program wherever and whenever is needed. Except very few research studies at national level, evaluation of the PSNP at regional and woreda level remains under research especially in Tigray National Regional State.

### 8. References

1. Anderson, A., Mekonnen, A., and Stage, J. (2009). Impacts of the Productive Safety Net Program in Ethiopia on Livestock and Tree Holdings of Rural Household. Environment for Development, Discussion Paper Series.
2. Attansion, O., and Meshard, A. (2006). The impact of a conditional cash transfer program on consumption in Colombia. Fiscal Studies, 27 (4).
3. Ayala, F.V., and Endara, C. (2005). Cash Transfers: Lesson learnt from the design and implementation of a conditional cash transfer program. Jamaican case: program for advancement through Health and Education. Policy case study draft prepared for the Inter-Regional Inequality facility.
4. Babatunde, R.O., Omotosho, O.A., and Sholotan, O.S. (2007). Socio-Economic Characteristics and Food Security Status of Farming Households in Kwara, North-Central, Nigeria. Pakistan Journal. 6(1).
5. Barnes, A. (2008). Food Crisis in the Horn of Africa. Alliance for Food Aid Written Testimony of Andre Barnes. <http://www.google.com.et/search=en&q=alliance+for+food+aid%ac+Andrew+Barnes&aqi=&aqi=&oq=&qs-rfai> (accessed on January, 2013).
6. Becker, S., and Ichino, A. (2002). Estimation of Average Treatment Effects Based on propensity scores. The stata Journal, 2(4), 358-377.
7. Dercon, S., and Krishnan, P. (2000). Vulnerability, seasonality and poverty in Ethiopia. Journal of Development Studies, 36(6).
8. Devereux, S., and Guenther, B. (2009). Agriculture and Social Protection in Ethiopia. FAC Working Paper No. SP03.
9. Devereux, S., Sabates-Wheeler, R., Tefera, M., and Taye, H. (2006). Ethiopia's Productive Safety Net Program. Trends in PSNP Transfers within Targeted Households. Report for DFID Ethiopia, Institute of Development Studies. Brighton.
10. ERSFE. (2009). Sustaining Livelihoods of Disaster Affected Communities and Facilitating Durable Solutions for Self-Reliance, Early Recovery Strategic Framework for Ethiopia. Addis Ababa, Ethiopia.

11. Ethiopia PSNP. (2006). Trends in PSNP Transfers within Targeted Households. Discussion draft, Institute of Development Studies, Sussex, UK Indak International,
12. Geberehiwot, T. (2008). Rural Food Security in Tigrai, Ethiopia. Policy Impact Evaluation. A thesis submitted to the International Institute for Geo-information Science and Earth observation in partial fulfillment of the requirements for the degree of Master of Science in Geo-information and Earth observation. The Netherlands.
13. Gilligan, D.O., Hoddinott, J., Seyoum, A.T. (2008). The impact of Ethiopia's Productive Safety Net Program and its Linkages. *Journal of Development Studies*, 45(10).
14. MoARD. (2009). Productive Safety Net Program Component. Ministry of Agriculture and Rural Development, Government of the Federal democratic republic of Ethiopia.
15. MoARD. (2004). Productive Safety Net Program, Program Implementation Manual. Ministry of Agriculture and Rural Development, Government of the Federal Democratic Republic of Ethiopia.
16. Morduch, J. (1995). Income smoothing and consumption smoothing. *Journal of Economic Perspectives*, 9(3).
17. Nigussa, F., and Mberengwa, I. (2009). Challenges of Productive Safety Net Program Implementation at local level. The case of Kuyu woreda, North Shewa zone, Oromia region, Ethiopia. *Journal of Sustainable Development in Africa*, 11(1).
18. Rachel, S., Ashley, S., Mulugeta, T., Mengistu, B., and Delelegne, E. (2006). Ethiopia's Productive Safety Net Program (PSNP). PSNP Policy, Program and Institutional Linkages, Final Report September 2006.
19. Ravallion, M., and B. Bidani. 1994. "How robust is a poverty profile?" *World Bank Economic Review* 8(1).
20. Rosenbaum, P.R., and Rubin, D.B. (1983). The Central Role of the Propensity Score in Observational Studies for Causal Effects. *Biometrika*, 70 (1).
21. Safriansyah, R. (2008). Social Safety Net Policy. A case study of Indonesia, 1997-2003. A thesis submitted in partial fulfillment of the requirement for the degree of master of human sciences in political science. Kulliyah of Islamic Revealed Knowledge and Human Sciences International Islamic University Malaysia. Indonesia.
22. Samson, M., Kaniki, S., Niekerk, I.V., and Quene. K.M. (2007). Social Transfers Evidence Base, Synthesis Document. The Social and Economic Impact of Cash Transfers. 17 November 2007, EPRI.
23. Samuel, G. (2006). Future Agriculture Correspondence to Ethiopia, proceeding.
24. Sumarto, S., Suryahadi, A., and Widyanti, W. (2005). Assessing the Impact of Indonesian Social Safety Net Programs on Household Welfare and Poverty Dynamics. *The European Journal of Development Research*, 17(1).
25. TFSCO. (2008). Tigrai Food Security Coordination Office, Productive Safety Net Program Annual Report 2008.
26. WBI (World Bank Institute), (2005). Introduction to Poverty Analysis; Poverty Manual, All, JH Revision
27. BoARD, (2009). Bureau of Agriculture and Rural Development, Central Zone of Tigrai National regional State