# Productive Safety Net Program and its Effects on Household Food Security in Rural Areas of Amhara Region, Ethiopia

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## Abstract

The Productive Safety Net Program (PSNP) was launched in 2005 in rural Ethiopia to tackle chronic food shortages in Ethiopia. The goal of PSNP is to assist households facing food insecurity by providing them with either cash or food support. The idea is to prevent these families from losing their assets and also to boost resources at the community level. Several studies have been conducted to examine the impact of PSNP on food security level of households. Nevertheless, their findings are inconclusive calling for further researches. Against this backdrop, the objective of this study is to examine how PSNP impacts household food security. The study randomly selected 383 households (280 beneficiary and 103 non-beneficiary households) in Shebel Berenta. To get a comprehensive view, key informant interviews and focus group discussions were conducted with experts managing the program and community members. By using a treatment effects model, the study found that PSNP significantly improves the food situation for the families enrolled in the program. More specifically, a range of analytical techniques—Regression Adjustment, Inverse Probability Weighting (IPW), IPW with Regression Adjustment, and Propensity Score Matching (psmatch2)—were employed to assess the impact of the program. All of the models revealed a statistically significant reduction in food insecurity. IPW and Propensity Score Matching showed a significant impact at a 10% significance level, while regression adjustment shows a significant impact at 1% level. These coefficients and significance levels indicate that the PSNP program contributes to decreasing household food insecurity,

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particularly evident through the negative HFIAS scores. This research adds valuable knowledge about how effective PSNP is in enhancing food security for households in this particular area. Essentially, it contributes to our understanding of how social safety net programs like PSNP impact households' access to food. In conclusion, this research underscores the significant positive impact of the PSNP on household food security in rural Ethiopia, recommending further implementation and expansion of such social safety net programs in similar contexts.

**Keywords:** Productive safety net program, treatment effects model, food security, Amhara Region, Ethiopia

# 1. Introduction

Poverty and food insecurity remain significant challenges worldwide, even in the post-Millennium period. According to the Food and Agriculture Organization (FAO) in 2023, nearly 783 million people of the world's population, suffer from hunger, with 282 million of them in Africa. The prevalence of undernourishment globally is 9.2%, but it stands at 19.7% in Africa and reaches 22.5% in Sub-Saharan Africa FAO (2023)

Ethiopia faces a significant challenge with hunger, affecting a substantial portion of its population. Approximately 32.1 million individuals, which is about 37.1% of the population, grapple with undernourishment, marking it as the African country with the highest number of undernourished people (Hagos et al., 2021). World Bank forecasted Ethiopia's poverty to be 24 % for the year 2023 using the international poverty line of $2.15 per adult per day as per 2017 purchasing power parity, contributing to over 26.4 million people experiencing undernourishment. Moreover, in 2023, the Food and Agriculture Organization (FAO) report shows that 21.9 % of households in Ethiopia face food insecurity and undernourishment. These statistics underscore the persistent and complex issue of food insecurity within the country.

Over 80% of Ethiopia's population lives in rural areas and relies heavily on subsistence agriculture, making smallholder farmers extremely vulnerable to changes in weather conditions, which can result in chronic and transitory food insecurity. Moreover, the country's food production capacity is declining due

to droughts, land degradation, population pressure, instability, and armed conflicts, which exacerbate the food insecurity problem. Poor soil fertility, land shortage, frost attack, chronic shortage of cash income, poor farming technologies, and poor social and infrastructural conditions also contribute to Ethiopia's growing food insecurity problem (Gebissa, 2021).

To address this problem, the Ethiopian government has collaborated with development partners to launch the PSNP, which aims to smooth household food consumption, protect household assets, and build community assets (Gilligan et al., 2008). The PSNP has gone through four phases, starting with a transition from an emergency system from January 2005 to December 2006. It initially targeted about 5.3 million chronically food-insecure households in 262 chronically food-insecure *Woredas* and later expanded to 8 million households (Desalegn, Ali and Seid, 2018). The second phase aimed to improve the efficiency, effectiveness, and fairness of the program in terms of ensuring timely, well-targeted transfers, the quality and environmental impact of the public works, and the complementarity with other food security interventions.

While attempts have been made to assess the effectiveness of Ethiopia's PSNP, there remain substantial gaps in the conducted studies. Many of these evaluations have primarily concentrated on measuring the program's influence on calorie intake and income expenditure, overlooking critical aspects like health, education, and women's empowerment. Furthermore, some studies have solely examined the short-term effects of the PSNP, leaving a notable gap in understanding its long-term implications for food security, poverty alleviation, and the establishment of sustainable livelihoods. This lack of comprehensive assessment hampers a thorough understanding of the program's holistic impact and its potential to address multifaceted challenges beyond immediate economic concerns.

Social and cultural contexts, such as gender dynamics and power relations within households and communities have not been fully explored, which could affect the program's effectiveness. More importantly, while most studies report positive impacts of the productive safety net program on livelihood outcomes, several others contend this to be the case (Andersson et

al. 2011; Mamo, 2011; Hayalu, 2014; Beshir, 2011; Gilligan et.al., 2009; Sabates-Wheeler and Devereux, 2010; Adimassu and Kessler, 2013), as they report negative impacts of the program. This indicates that the results are inconclusive requiring additional research using rigorous evaluation methodologies, such as quasi-experimental designs. Moreover, research is needed to identify the factors that facilitate or hinder the implementation and effectiveness of the program in different contexts and populations. Such factors may include cultural, socioeconomic, and political factors, as well as characteristics of the program itself, such as its scalability, feasibility, and sustainability. By understanding these factors, policymakers and program implementers can make informed decisions about how to design and implement effective interventions to address important social issues. Against the backdrop of the gaps identified, the objective of this article is to analyze the impact of PSNP on food security of households in Shebel Berenta *Woreda* of the Amhara Region. The objectives of this study are twofold: the first is to identify determinants of participation in PSNP and the second is to examine the impact of the program on the food security status of households. The hypothesis being investigated is whether the implementation of the productive safety net program has significantly impacted the food security status of households.

## 2. Data and Methodology

### 2.1 Study area

Shebel Berenta is a *woreda* located in the East Gojjam Zone of the Amhara region. It covers an area of about 89,714 hectares, divided into 22 rural and 4 urban Kebeles (Shebel Berenta *Woreda* Agriculture Office, 2020). The *woreda* is bordered by Enarj Enawga *Woreda* to the north, Blue Nile/Abay River to the south and southeast, Enemay *woreda* to the northwest, and Dejen *woreda* to the southwest.

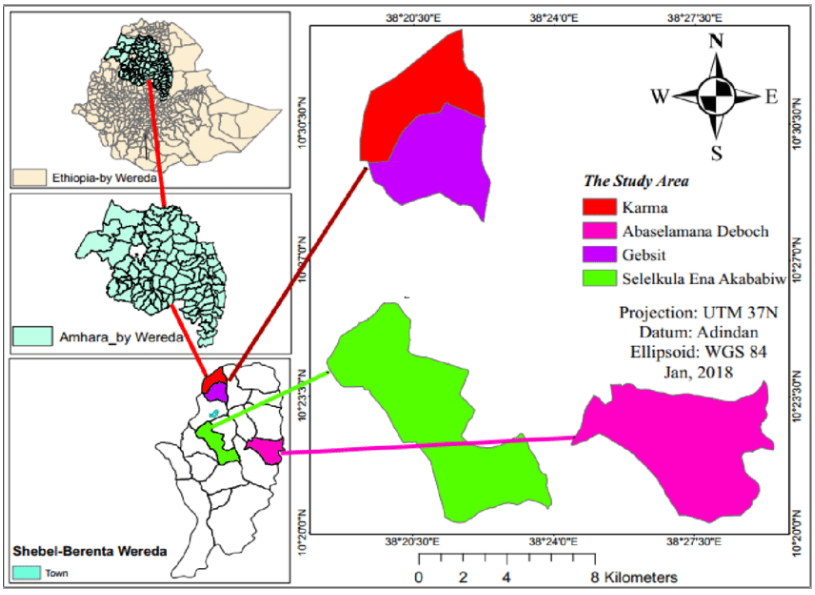


Figure 1. Map of Shebel Berenta Woreda
*Source: Eyasu (2021)*

According to the Shebel Berenta *Woreda* Office of Finance and Economic Development (2019), the *woreda* has a total population of about 134,666, with 63,865 male and 70,801 female inhabitants. Approximately 96.4% of the population is rural, and agriculture and related activities serve as the primary sources of livelihood. The *woreda's* terrain is characterized by undulating plains, valleys, and mountains. The plain covers 44% of the area, while the valley covers 48%, and the mountain covers 8%. Farming is the major livelihood in both the plain and valley landforms. However, soil degradation caused by erosion and other human activities is more pronounced in the valleys than in the mid-land plains.

According to information generated from the Agricultural Office of the *woreda*, the area receives low seasonal rainfall, with almost 90% of its total annual rainfall being received during the Summer/*Kiremt* season only. The rainfall is spatially variable, with most parts of the *woreda* designated as tropical/*kolla* receiving very low amounts of rainfall with an erratic and unreliable nature. Conversely, the *Woina Dega* agro-ecological zone, covering approximately 28% of the total land area, receives relatively sufficient rainfall. The variation in rainfall among these different agro-

ecological zones is mainly due to differences in altitude. The *woreda's* annual rainfall ranges from 400mm-1000mm, with a mean annual rainfall of about 700mm. The trend has shown an increase in temperature and a decrease in rainfall due to the decrease in vegetation cover and depleted topsoil, caused by population pressure.

The increase in temperature and a substantial decrease in rainfall have had a significant impact on agricultural productivity and food security in the *woreda*[1]. Land degradation has also worsened in the past few decades due to over-farming and deforestation of natural vegetation, resulting in a shortage of arable land. As a result, Shebel Berenta is one of the chronically food-insecure *woredas* in the East Gojjam Zone and the Amhara region in general. In 2002/3, the vulnerability scale assessment identified Shebel Berenta as one of the four *woredas* in the East Gojjam Zone that are chronically food-insecure due to deforestation, farmland depletion, and topsoil erosion. In response to the *Woreda's* susceptibility to droughts and other environment-related risks, the Government of Ethiopia and the World Bank implemented the PSNP in 2005.

## 2.2. Research philosophy and design

In this proposed research, a pragmatic philosophy is being utilized as the research method involves a mixed approach. The pragmatic worldview empowers researchers to employ varied yet complementary strategies to address research inquiries (Teddlie & Tashakkori, 2003). This approach has arisen to surmount the constraints associated with mono-method research approaches.

Pragmatism provides the basis for knowledge in a way that is not committed to any one system of philosophy, but rather gives researchers the freedom to choose the methods, techniques, and procedures of research that best meet their needs and purposes (Cherrholmes, 1992). Pragmatists do not see the world as an absolute unity and recognize that multiple perspectives and methods can be used to better understand complex phenomena.

In the context of mixed methods research, triangulation was utilized by the researcher to gather and analyze data, avoiding reliance on a singular

approach. For this study, the researcher employed an explanatory research design from among several available designs to identify and acquire the necessary information. This particular design excelled in offering insights into causal relationships, aligning well with the research objectives and hypothesis set for investigation.

## 2.3. Sampling

The study area for this research is randomly identified. This is to find both the beneficiaries and non-beneficiaries of PSNP. The unit of analysis of the study is households in the rural areas.

Sample size determination formula developed by Cochran (1977) was used and is presented as follows.

$$n_0 = \frac{z^2 pq}{e^2}$$

Where, $n_0$is sample size, z is the selected value of desired confidence level, p is the estimated proportion of an attribute that is present in the population, q=1-p and e, the desired level of precision.

Finally, the following formula is used to determine the sample size used for the study:

$$n = \frac{n_0}{1 + \frac{(n_0 - 1)}{N}}$$

Whereas N is population size, which is 32,589 rural households. Based on the above formula, a total of 383 households were considered for the study. Since households were classified as PSNP beneficiaries and non-beneficiaries, the proportional allocation method is used to get representative households of the strata (Bowley, 1962). Accordingly, 102 and 281 households were sampled from beneficiary and non-beneficiary category. Out of these, 108, 82, 91 and 102 households were sampled from Gedayasu, Mergech, Mozhen and Selelkula kebeles, respectively. List of households from PSNP coordination office and the kebele administration was used as a sampling frame. Finally,

using proportional to size sampling technique, representative households were randomly sampled from each kebele. The proportion is allocated as follows: $n_{i=}\, n\frac{N_i}{N}$, where n=sample size, $N_i$ =population size of the $i^{th}$ strata and N population size, i = 1, 2, 3.

## 2.4 Method of data collection

In pursuit of the study's objective, a blend of quantitative and qualitative data were gathered. The researcher opted for face-to-face interviews to guarantee comprehensive responses and to prevent overlooking crucial details. The questionnaire, initially crafted in English, underwent translation into Amharic to uphold response consistency. The questionnaire's design aimed to extract insights on demographic specifics, resource ownership, income levels, food security status, and poverty indicators, with the goal of generating data conducive to quantitative analysis.

To validate the results of the quantitative analysis, key informant interviews and focus group discussions were also conducted. Participants for these sessions were selected purposively, with a focus on those who had rich and deep understanding of the issue. The head of the *Woreda* Office of Agriculture and the head of PSNP were among the key informants interviewed. The aim of the interviews was to gather in-depth information on the impact of PSNP on the community. Focus group discussions were conducted to generate qualitative data and provide a general picture of the impact of PSNP on the community.

## 2.5. Method of data analysis

In this article, treatment effects model (with a variety of algorithms) was used. One of these was propensity score matching (PSM), which is a statistical method used to evaluate the impact of a program on various outcome variables (Rosenbaum and Rubin, 1983). It constructs a comparison group based on a model of the probability of participating in the program using observed characteristics, and participants and non-participants are then matched based on their propensity scores. The propensity score is the probability of participating in the treatment, given a set of observable covariates “X” that are not affected by treatment.

The model is specified as follows:

For the PSNP household, T=1 is observed, whereas for a non-participant, T=0 is observed.

Accordingly, the impact of PSNP is obtained by:

$$E\left(\frac{Y^1}{T}=1\right)-E(Y^0/T=0)\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots..1$$

Where T=1 stands for participation in PSNP and "0" otherwise.

However, selection bias (which is the systematic difference between beneficiary and non-beneficiary households in the absence of treatment) should be taken care of for the true effect of PSNP to be captured.

Therefore, the model is re-specified as follows by subtracting and adding the counterfactual for the treated group:

$$E\left(\frac{Y^1}{T}=1\right)-\ E\left(\frac{Y^0}{T}=1\right)+\ E\left(\frac{Y^0}{T}=1\right)-\ E(Y^0/T=0)\ldots\ldots\ldots\ldots2$$

Collecting like terms, equation (2) becomes:

$$E\left(Y^1-\frac{Y^0}{T}=1\right)+\ E\left(\frac{Y^0}{T}=1\right)-E(Y^0/T=0)\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots3$$

The first part, which contains is the Average Treatment Effect on the Treated (ATET) $E(Y^1-Y^0/T=1)$ and the second part is the selection bias ($E(Y^0/T=1)$- $E(Y^0/T=0)$).

In order to reduce the selection bias and net out the true effect of PSNP, we used treatment effects model. One of the treatment effects model, is Propensity Score Matching (PSM). This model requires the assumptions of conditional independence and common support to identify the program effect. Conditional independence states that given a set of observable covariates X that are not affected by treatment, potential outcomes Y are independent of treatment assignment T. The presence of a common support means that the distribution of the propensity scores for the treated and control groups overlap, ensuring that comparable units are available for comparison.

The common support assumption states that $0 < P(Ti=1|Xi) < 1$, where Ti is the treatment indicator and Xi are the observed covariates. The balancing property also requires that within each propensity score interval, the mean propensity score of each conditioning variable is equal for the treated and control households.

The treatment effect of the program using these methods can be represented as either the average treatment effect (ATE) or the treatment effect on the treated (ATET or ATT). The estimation of the treatment effect can be calculated using the potential outcomes $Y_{1i}$ and $Y_{0i}$, which represent the outcomes for participants and non-participants, respectively. The ATET is the expected effect of the program for individuals who received the treatment (i.e., the PSNP), and the ATE is the expected effect of the program for a randomly selected individual. For our analysis, we focused on the former. For robustness check, we used several other algorithms in addition to PSM. To measure food security, we used Household Food Insecurity Access Scale (HFIAS), as it is simple, valid and more comprehensive in terms of capturing conditions ranging from mild food insecurity to very severe food insecurity (Coates, et al., 2007).

## 3. Results and Discussion

### 3.1 Descriptive analysis

Results of the descriptive analysis show that the respondents in the study have a mean age of 45.2, with a standard deviation of 13.5. This indicates that the sample population is middle-aged. Additionally, the average household size is 4.68, which is slightly lower than the national average of 5 members. The study also revealed that the average number of years of schooling for the respondents is only 3 years, which indicates a high level of illiteracy in the study area. This finding highlights the need for educational interventions to improve literacy rates in the region. Moreover, the average Food Consumption Score (FCS) and HFIAS stand at 90.62 and 14.38, respectively. However, land and livestock ownership are at their lowest levels, with a mean value of only 0.9s ha and 1.62 Tropical Livestock Unity (TLU), respectively. These figures indicate that the sample population has limited access to

productive resources, which may contribute to their food insecurity and poverty.

To investigate the relationship between gender and participation in the PSNP, a chi-square test was conducted. The results of the test showed that 48% of female-headed households and 19% of male-headed households participated in the PSNP program. These findings suggest a statistically significant association between the gender of the household head and participation in PSNP (with Pearson chi2 (1) = 31.6255 and Pr= 0.000). The large difference in participation rates between male and female-headed households indicates that gender plays a significant role in determining households' access to the PSNP program. The gender-based disparity in participation rates may be due to various factors, including differences in household composition, access to information, and decision-making power. This was also triangulated from key informant interviews and focus group discussions suggesting that females tend to be favored to join the program owing to their limited access to and control over other resources in to augment their otherwise meagre incomes.

In terms of participation based on economic status, results of the Chi-square test also show that 17.65%, 44.12% and 38.24% of beneficiary households are in poor, borderline and acceptable food consumption category compared to 10.36%, 24.29% and 65.36% of non-beneficiary households in the categories specified, respectively. This association between participation status in PSNP and falling in a specific food consumption category is statistically significant at 1% level of significance (P=0.0000).

## 3.2 Inferential statistics

Alongside descriptive analysis, an inferential statistical analysis, namely an independent samples t-test, was conducted to compare the food consumption scores of the PSNP participants and non-participants (Table 1).

Table 1. Two sample t test with equal variances to compare mean ownership of Livestock (TLU)

| Group | Obs | Mean | Std. Err. | [95% Conf. Interval] |
|---|---|---|---|---|
| non-bene | 281 | 1.893488 | 0.0935181 | 1.7094 2.077575 |
| benefici | 102 | .8842157 | 0.0916156 | 0.7024749 1.065956 |
| combined | 383 | 1.6247 | 0.0762578 | 1.474762 1.774637 |
| diff | | 1.009272 | 0.1648222 | 0.6851969 1.333347 |
| diff= mean (non-bene) - mean (benefici) t = 6.1234 | | | | |
| Ho: diff = 0 degrees of freedom = 381 | | | | |
| Ha: diff < 0 Ha: diff != 0 Ha: diff > 0 | | | | |
| Pr (T < t) = 1.0000 Pr (\|T\| > \|t\|) =0.0000 Pr (T > t) = 0.0000 | | | | |

Table 1 shows that non-beneficiary households are better-off than their counter parts in terms of the number of livestock (TLU) they own. While they own 1.89 TLUs on average, beneficiaries own only 0.88. The difference is statistically significant at 1% level (T-value and p-value of 6.12 and 0.0000, respectively).

A similar analysis was done pertinent to food consumption score. According to Table 2, the mean food consumption score of the treated group (participants or beneficiary households) is 32.59, while that of the control group (non-participants) is 39.25, resulting in a difference of 6.65. The calculated t-value of 4.85 and p-value of 0.0000 suggests that this difference is statistically significant at 1% level of significance.

Table 2. Mean Difference in food consumption score between beneficiary (1) and control (0) groups

| Group | Obs | Mean | Std. Err. | [95% Conf. Interval] |
|---|---|---|---|---|
| Non_beneficiaries | 281 | 39.25089 | 0.763 | 37.74895 40.75283 |
| Beneficiaries | 102 | 32.59804 | 0.8719189 | 30.86839 34.32769 |

| | | | | | |
|---|---|---|---|---|---|
| combined | 383 | 37.47911 | 0.6238975 | 36.25241 | 38.70582 |
| diff | | 6.65285 | 1.371564 | 3.956067 | 9.349634 |
| diff= mean (non_beneneficiaries) - mean (beneficiaries) t = 4.8506 | | | | | |
| Ho: diff = 0 degrees of freedom = 381 | | | | | |
| Ha: diff < 0 Ha: diff != 0 Ha: diff > 0 | | | | | |
| Pr (T < t) = 1.0000 Pr (\|T\| > \|t\|) =0.0000 Pr (T > t) = 0.0000 | | | | | |

An independent samples t-test was also conducted to compare the Household Food Insecurity Access Scale (HFIAS) scores of the treated (participants) and control (non-participants) groups. The results of the t-test (Table 3) reveal that the mean HFIAS score for the treated group is significantly lower than that of the control group. This indicates that the treated group is better off in terms of their resilience to food insecurity compared to their non-member counterparts. The statistically significant difference between the two groups suggests that the PSNP program might have a positive impact on household food insecurity in the study area. The PSNP beneficiaries may have benefited from the program's various components, including cash transfers, food assistance, and asset-building activities, which can help improve household food security in the long term. It is important to note that while the t-test provides evidence of a statistically significant difference between the two groups, other factors beyond PSNP participation may also contribute to household food insecurity. These factors may include environmental shocks, market prices, and socio-economic conditions, among others. Therefore, future studies may consider exploring the complex interplay of these factors to better understand the determinants of household food insecurity in the study area.

Table 3. Mean Difference in HFIAS between Treated (1) and Control (0) Groups

| **Group** | **Obs** | **Mean** | **Std. Err.** | **[95% Conf. Interval]** | |
|---|---|---|---|---|---|
| 0 | 279 | 14.81004 | 0.1618963 | 14.49134 | 15.12873 |
| 1 | 102 | 13.19608 | .2225142 | 12.75467 | 13.63749 |
| combined | 381 | 14.37795 | 0.1375082 | 14.10758 | 14.64833 |
| diff | | 1.613957 | 0.2997193 | 1.024636 | 2.203278 |
| diff= mean (0) - mean (1) t = 5.3849 | | | | | |
| Ho: diff = 0 degrees of freedom = 379 | | | | | |
| Ha: diff < 0 Ha: diff != 0 Ha: diff > 0 | | | | | |

| | | |
|---|---|---|
| Pr (T < t) = 1.0000 | Pr (\|T\| > \|t\|) =0.0000 | Pr (T > t) = 0.0000 |

## 3.3. Model Results

### *3.3.1. Determinants of participation in PSNP*

The logistic regression analysis presented in Table 4 provides valuable insights into the factors that determine household participation in the PSNP. Table 4 shows that two factors, namely livestock ownership and the sex of the household head, have significant effects on PSNP participation. As indicated in Table 4, livestock ownership measured in TLU has a negative effect on households'' participation status in the PSNP program. This finding is consistent with previous research that has reported a negative correlation between TLU and PSNP participation (Gilligan and Hoddinott, 2007). Owning livestock is often associated with higher levels of wealth and income, making households less eligible for the program's support. On the other hand, being a female head of the household has a positive and significant effect on PSNP participation. Female-headed households often face greater challenges in accessing resources and opportunities, and PSNP may be designed to favor them. It is important to note that gender inequality is a pervasive issue in many rural areas, and the results of this study (Table 4) suggest that PSNP can be used as a tool to address gender gaps in access to resources by providing support to female-headed households. Similarly, the findings of this study suggest that livestock ownership and gender should be considered in the design and implementation of PSNP. These factors play a crucial role in determining participation in the program, and ignoring them could lead to exclusion of vulnerable households. Similarly, households who receive remittances have less probability of participating in PSNP.

Marginal effects of the probit regression analysis (Table 4) highlight the significant role of livestock ownership, remittance and the sex of the household head in determining household participation in PSNP. Female-headed households, households having a smaller number of livestock and those who do not receive remittance are more likely to join PSNP. The findings indicate the need for targeted interventions to address gender

inequality and support vulnerable households in accessing resources and opportunities.

Table 4. Marginal effects on determinants of participation in PSNP

| **Variable** | **dy/dx** | **Std. Err** | **z** | **P > \|z \|** | **x** |
|---|---|---|---|---|---|
| Age (years) | 0.0013097 | 0.00169 | 0.77 | 0.440 | 45.2037 |
| sex respondent (1=female) | 0.1873423 | 0.05968 | 3.14 | 0.002 | 0.261097 |
| Land (in ha) | -0.111037 | 0.12101 | -0.92 | 0.359 | 0.953003 |
| Livestock (in TLU) | -0.090141 | 0.01963 | -4.59 | 0.000 | 1.6247 |
| Saving (1= yes) | 0.0529751 | 0.04781 | 1.11 | 0.268 | 0.582245 |
| Can you read and write (1= yes) | -0.071563 | 0.04729 | -1.51 | 0.130 | 0.394256 |
| Remittance (1=received & 0= otherwise) | -0.170639 | 0.09118 | -1.87 | 0.061 | 0.02611 |
| Credit access (1= yes) | -0.079437 | 0.05599 | -1.42 | 0.156 | 0.744125 |

y = Pr (psnpben) (predict) = .22574941

### *3.3.2. Impact of PSNP on food security status of households*

Matching techniques are essential for ensuring credible impact evaluation results by reducing selection bias, and the PSNP program remains an effective intervention for improving food security outcomes for vulnerable populations in Ethiopia. Accordingly, this study used impact evaluation methods to investigate the effect of the PSNP on HFIAS. The results indicated that there was no statistically significant difference in FCS between PSNP beneficiaries and non-beneficiaries (Table 5).

This study did not find a significant impact of PSNP on food consumption unlike previous studies that reported positive effects of the program on food security outcomes. The result is in tandem with findings of similar studies. For example, MacAuslan and Schofield (2011) found no significant effect of cash transfer program on dietary diversity level of households in Nairobi.

Similarly, Merttens et al. (2013) found that Kenya's Hunger Safety Net Program (HNSP) did not positively and significantly impact dietary diversity of households. Nevertheless, the finding of this study contrasts with the findings of several other studies. For instance, Yablonski and Woldehanna (2008) found that beneficiaries of social transfers were able to get access to more and better-quality food in Ethiopia. Similarly, the findings of Hidrobo et al. (2012) showed that cash transfer increased beneficiary households' dietary diversity in northern Ecuador. A similar result was found in Bangladesh where the cash-for-work program led to more varied food (Mascie-Taylor et al., 2010).

The findings of this study (Table 5) show that PSNP significantly reduces HFIAS scores. This implies that there is strong evidence to suggest that the PSNP program has a positive impact on food security outcomes, specifically the HFIAS score. This finding is in contrast to findings of other studies which have shown that PSNP has not improved food security situation of beneficiary households. For instance, a study conducted in Ethiopia by Bezawit et al., (2020) showed that PSNP does have significant impact on household food security level including child dietary diversity.

Table 5 compares the impacts of various methodologies—Regression Adjustment, Inverse Probability Weighting (IPW), IPW with Regression Adjustment, and Propensity Score Matching (psmatch2)—on a specific algorithm measuring food insecurity using HFIAS. A negative value indicates a positive significance, as HFIAS measures food insecurity. Accordingly, Regression Adjustment indicates a statistically significant positive impact (Coefficient: -0.9193, Z-value: -2.75, p-value: 0.006), suggesting a substantial association between the algorithm and a reduction in food insecurity as measured by HFIAS. Inverse Probability Weighting also shows a positive impact of reducing food insecurity at 10% level with a coefficient -0.6134, a Z-value -1.71, and a p-value of 0.088. IPW combined with Regression Adjustment also displays a a impact (Coefficient: -0.6664) that is marginally significant at 5% level (Z-value: -1.97, p-value: 0.049). This suggests a positive effect on reducing food insecurity measured by HFIAS, slightly exceeding the 5% threshold. Similarly, Propensity Score Matching (psmatch2) suggests a negative coefficient of -0.7327 and a Z-value of 1.70

suggesting a positive impact of reducing food insecurity at 10% significance level.

Overall, all models demonstrate a positive impact on reducing food insecurity, albeit with varying degrees of significance. Regression Adjustment stands out, showing a notably significant positive effect, followed by IPW with Regression Adjustment displaying a comparatively weaker yet still statistically significant positive impact. Inverse Probability Weighting and Propensity Score Matching also suggest positive impacts, with the latter approaching marginal significance at the 10% level. Each model indicates a positive influence on reducing food insecurity measured by HFIAS, emphasizing the importance of considering the nuances in the degrees of significance across different methodologies.

Table 5. Impact of PSNP on HFIAS

| Algorithm | Coef. | Robust Std. Err | Z | p |
|---|---|---|---|---|
| Regression Adjustment | -0.9193 | 0.3348 | -2.75 | 0.006 |
| IPW with regression adjustment | -0.628 | 0.33 | -1.90 | 0.058 |
| Propensity Score matching (psmatch2) | -0.696 | 0.38 | 1.83 | 0.067 |

Annex 1 shows that the impact analysis we did fulfils the assumptions of the treatment effects model whereby standardized differences and variance ratio for the matched sample are less than 25% and 2, respectively. Annexes 2 and 3 also show corroborating evidence of indicating that the balancing property is satisfied.

## 4. Conclusions and Policy Implications

This study aimed to assess the effectiveness of the PSNP in alleviating household food insecurity, focusing on the HFIAS. While comparisons of food consumption scores between treated (participants) and control (non-participants) groups showed marginal differences, the pronounced contrast in HFIAS scores indicated significantly lower levels of food insecurity among

PSNP beneficiaries. Utilizing various methodologies, including Regression Adjustment, IPW, IPW with Regression Adjustment, and Propensity Score Matching, this research sought to comprehensively gauge the program's impact on food insecurity.

The matching exercise implemented in this study aimed to create a more balanced comparison group by aligning observable characteristics between beneficiaries and non-beneficiaries. Results suggested a positive impact of the PSNP program on the food security of beneficiaries, corroborating findings from previous studies in Ethiopia. However, contrasting evidence from another study questioned the program's direct impact on HFIAS scores, hinting at the necessity for additional components, such as livelihood diversification or asset-building initiatives, to foster more sustainable food security outcomes.

This research unveiled significant challenges faced by the sampled population, characterized by low education levels and restricted access to productive resources. These findings underscore the pressing need for interventions aimed at enhancing livelihoods in the study area, where social protection programs like PSNP could play a pivotal role. Furthermore, the findings concerning food consumption scores between PSNP participants and non-participants in the study area did not yield statistically significant differences. This could be because food consumption score considers a variety of food groups, which are not commonly consumed in the study area, which is cereal dominated. However, evaluating the program's impact using multiple indicators is essential for a comprehensive understanding of its efficacy in enhancing household food security. Overall, this research underscores the potential of targeted interventions, such as the PSNP, in mitigating food insecurity, emphasizing the need for a deeper exploration of multifaceted determinants beyond program participation for more effective policy formulation and implementation.

The study highlights potential actionable interventions that could be considered based on the findings of this study:

1. Program Diversification: Expand the program's components beyond direct assistance. Including initiatives for livelihood diversification and asset-building can significantly contribute to building more sustainable and resilient food security outcomes. By broadening the program's scope to enhance household capabilities, it can better address the multifaceted nature of food insecurity.
2. Holistic Evaluation Metrics: Implement a comprehensive set of evaluation metrics that go beyond mere food consumption scores. Incorporating diverse indicators related to dietary diversity, nutritional intake, access to healthcare, and educational opportunities can offer a more comprehensive understanding of the program's effectiveness in enhancing food security and overall well-being.
3. Enhancing Resilience: While the PSNP has positively impacted the food security status of beneficiary households, it is crucial to focus on building resilience within these households. Programs should integrate additional components, such as livelihood diversification and asset-building initiatives, to foster long-term sustainability and resilience in achieving food security objectives.

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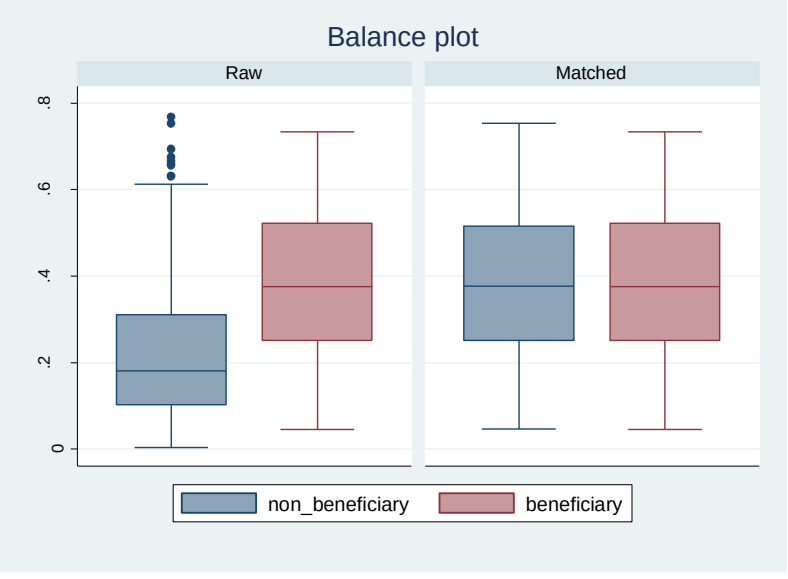
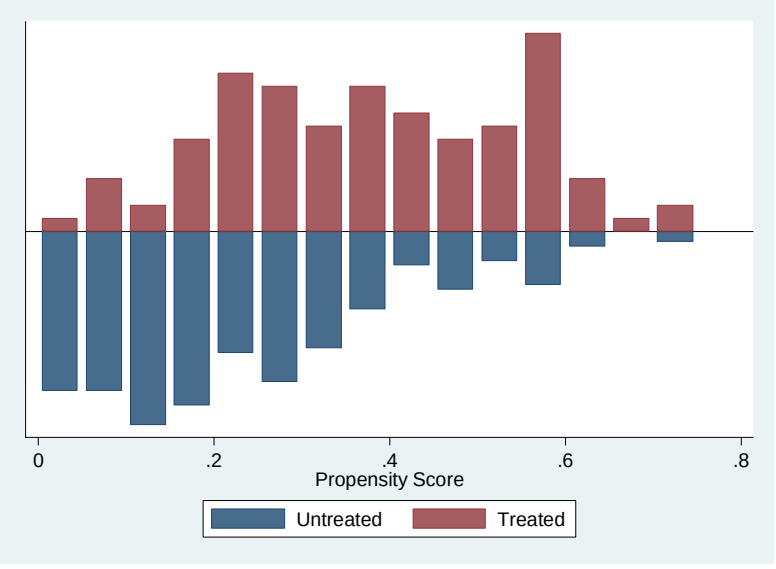
Annex1. Checking the Balancing Property

| Variables | standardized differences | | variance ratio | |
|---|---|---|---|---|
| | Raw | Matched | Raw | Matched |
| Age of respondents | -.015427 | .2487941 | .764542 | .740489 |
| Sex of respondents | .6325199 | .0195585 | 1.65323 | 1.002708 |
| land | -.1835485 | -.1664265 | 2.104714 | 1.918367 |
| TLU | -.7956387 | .2109746 | .3495512 | 1.523628 |
| saving | -.2007879 | -.1773334 | 1.056393 | 1.039584 |
| Education status of respondents | -.3813169 | 0 | .7932299 | 1 |
| Access to remittances | -.1565715 | 0 | .3129267 | 1 |
| Access to credit | -.2700076 | -.3343895 | 1.312257 | 1.429878 |

Annex 2. Balancing Property




Annex 3. Quality checks of the matching exercise




## Endnotes

1. Determinants Variables for Women's Participation in Non-Agricultural Livelihood Diversification Strategies in Ethiopia: A Logistic Regression Model Analysis. Journal of Poverty, Investment and Development, Vol. 58.