

RESEARCH ARTICLE

Productive Safety Net Program Determinants and their Impact on Rural Household Food Security in Somali Regional State: The Case of Kebri Dehar District) Ethiopia

Abdi Hassen Habib^{1*}, Mohamed Abdirizak Haji¹, Abdukerim Ahmed Mumed²

¹Department of Accounting and Finance, College of Business and Economics, Kebri Dehar University, Kebri Dehar, Ethiopia

²Rural development and Agricultural Extension, Kebri Dehar University, Kebri Dehar, Ethiopia

Corresponding Author: Abdi Hassen Habib; email: abdihasen1170@gmail.com

Received: 06 February, 2023, Accepted: 18 March, 2023, Published: 20 March, 2023

Abstract: The study looked specifically at household food security, factors influencing people's decisions to participate in productive safety net programs, and the impact of production safety net programs on rural household food security, as measured by calorie intake. Primary data were collected from 334 households in four kebeles samples in Kebri Dehar, the district, using a multistage sampling technique. A binary logit model and a propensity score matching model were used to investigate the factors influencing the decision to participate and their impact on food security, respectively. The age of the household head and the size of the family have a positive effect on the decision to join the household. However, extended contact and distance from the property market had a negative impact on the decision to join. In this study, the nearest neighbor match method (5) was used to estimate the mean treatment effect for those treated. The propensity score matching results also show that the production safety net program has a positive and significant impact on household food security. Households participating in the production safety net program have 214.5 kcal/adult/day more than households not participating. The study concluded that there was a significant difference in household calorie intake between participants and nonparticipants.

Key words: Food security; Impact; Productive safety net program; Propensity score matching

Introduction

Background of Study

Food security emerged as a concept in the mid-1970s after a number of implications sparked debates about the global food supply and its responsiveness at both the global and local levels (Ingela and Nagothu, 2017). However, problems such as family or man-woman supply, dietary quality, and environmental sustainability have not been noted (Ingela and Nagothu, 2017).

In terms of food security, Ethiopia is one of the poorest international locations in Sub-Saharan Africa. A large proportion of the country's population suffers from chronic and power meal insecurity (Anderson et al., 2015). Many elements contribute to rural poverty and persistent food insecurity. The important causes of food insecurity in Ethiopia are drought and animal diseases, restrained rural infrastructure, a very susceptible agricultural technical base, constrained access to fundamental services, and fluctuating file costs (FISN, 2017).

The population's meal insecurity is anticipated to increase from 5.6 million in 2016 to 8.5 million in 2017 (WFP, 2017). Food insecurity is often understood in Ethiopia in the context of repeated meal crises and famines, and the response to meal insecurity is regularly

dominated by the meal emergency response. Between 1994 and 2005, nearly 5 million Ethiopians were declared "inclined" and "wanting" assistance. However, large proportions of households receive emergency food assistance, participate in community service projects, and no longer go hungry every year; they are, however, frequently food insecure. Because of constrained agricultural manufacturing and poverty, they face predictable annual meal shortages.

As a result, despite a long history of providing large amounts of food, the safety of their meals has deteriorated over time. Instead, reliance on meals as a useful resource has progressively extended over time, as has the wide variety of Ethiopians experiencing continual meal insecurity (Devereux et al. 2006). The purpose of the Safety Net Program is to reallocate assets to chronically food-insecure households and enhance long-term options for food-insecure households (USAID, 2012).

Statement of Problem

The Food Security Program used to be created to tackle the difficulty of meal manufacturing while additionally enhancing people's lives and alleviating poverty. Recognizing its significance, the authorities have taken a

number of steps. Beginning in 2005, the Ethiopian authorities and donor companies carried out a new kind of protection, the Productive Safety Net Program (PSNP), with ambitions to minimize persistent meal insecurity, asset depletion, and productive funding to overcome long-term meal insecurity (Gilligan et al., 2008).

The application is aimed at her 8.5 million inhabitants, who make up 10% of Ethiopia's population. These human beings are chronically food insecure; 60% of them stay in pastoral areas, and their buying power has decreased due to farm animals' losses. The final 40% are affected by erratic rainfall, which reduces crop manufacturing (WFP, 2017)

In the Somali region, the Ethiopian authorities have prepared to assist negative rural households registered in chronically food-insecure districts. Learn about the effect of productive protection internet packages (PSNP) on family livelihoods with the help of (Mohamed, 2017): Babile Case discovered that effective internet security programs had a significant impact on the food safety of families. Various studies have been performed on the outcomes of PSNP in special fields and at exclusive times.

The findings of these investigations varied. Food safety research, on the other hand, necessitates a multidimensional shift supported by well-informed lookup disciplines. By assessing the influence of PSNPs on meal safety in rural households, this study contributes to the current body of knowledge. As a result, the goal of this study is to fill knowledge gaps about the factors that influence productive safety net programs determinants and their impact on rural household food security.

Objective of the study

The primary aim of this study was to assess the Productive Safety Net Program Determinants and Their Impact on Rural Household Food Security in Somali Regional State: The Case of Kebri Dehar District Ethiopia

Specific objectives are as follows:

1. To investigate the current food security situation of rural households in the study area.
2. Determining the Impact of Productive Safety Net Programs on Food Security in Rural Households
3. Assessing the Impact of Productive Safety Net Programs on Food Security in Rural Households

Significance of the Study

It was thought that the study's findings will benefit the ongoing RPSNP efforts in rural Kebri Dahar households to enhance the current state of food security. By adding fresh information to the research of food security in relation to PSNP in Rural households of the Korahay

zone, the study thereby fills a gap in the existing understanding regarding PSNP. Additionally, it might assist other academics who want to look into the PSNP issue more deeply. Additionally, the study's methodological importance helped other researchers by imparting knowledge and learning lessons to better understand the difficulties, achievements, and improved living standards of RPSNP. The study served as a starting point for future investigations into the PSNP problem.

Empirical Literature

Results of a find out about carried out via of Abdusalem (2017) we learned that household size, schooling level, increased seed use, and distance to the nearest market have been drastically positively associated with a rural household's likelihood of participating in a productive safety net program. It shows that you made an impact. There were significant negative effects on participation in productive safety net programs

According to Abdulkarim (2015), family size, active workforce, access to credit, off/off farm income, farm income, and household education level significantly influence participation in productive food security programs. In the same study by Tadelee (2011) Family safety nets in productive programs have been linked to the gender of the family head, the educational level of family members, meal protection issues, and the frequency of contact with improved employees. Additionally, a high-quality affiliation was confirmed between big household measurement and participation in the PSNP, suggesting that small family measurement was once related to larger meal demand compared with smaller households excessive and may additionally be related to a greater possibility of meal insecurity.

According to Ayalneh and Wubshet (2012) livestock ownership correlates positively with well-being but negatively with program participation, whereas having the ability to use credit services correlates positively with program participation. The study undertaken by Yibrah (2010) discovered that as a household's age increased, so did the likelihood of participating in a productive safety net program, which had a negative effect on participation.

The find out by Aman (2014) holdings, cultivated land, and distance from markets significantly affect participation in productive safety net programs. Participation in the PSNP was positively and significantly affected by variable distances from the market, whereas participation was negatively and significantly affected by access to credit services, extension contacts, the number of oxen, livestock holdings, and cultivated land. Similarly, the study by Anwar (2015) indicated that family head educational level, household size, livestock holding, extension remoteness, and market distance were significantly associated with participation in productive safety net programs. Also, the study undertaken by Mesfin (2018) indicated that the educational level of households

Conceptual Framework

It is clear that several factors may help to explain the determinants of household food security and the Rural Productive Safety Net Program (RPSNP). Based on the objective of the study, the independent variables selected

to achieve the ultimate objective of the study are broadly categorized into socioeconomic, institutional, and demographic factors the relationship between two variables in this study.

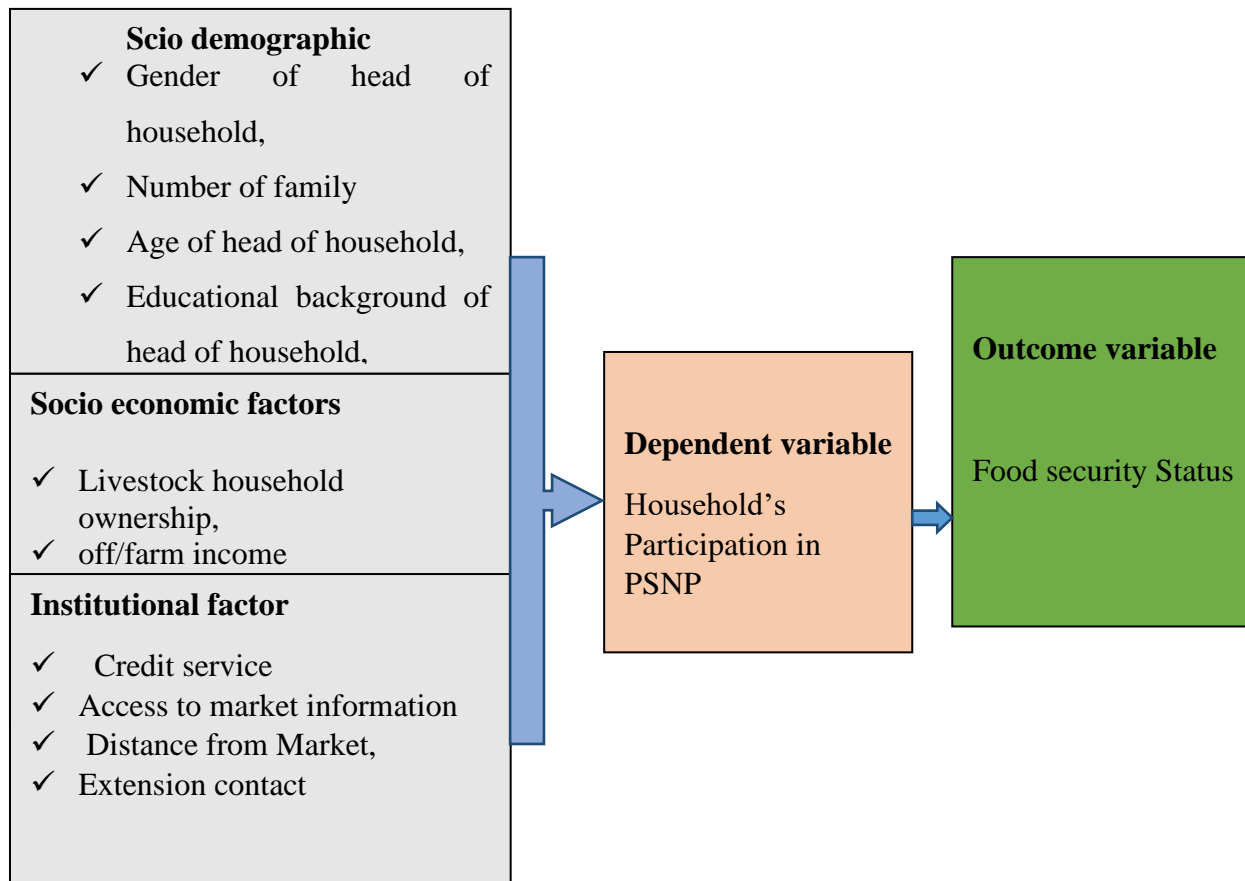


Figure 1: Conceptual Frame work of food security and UPSNP

Source: Own design based on literature review

Method of Research.

In this chapter, the research methodology for the study is described, along with a description of the research field, data sources and types, target population, sampling techniques, sample size, data collection methods, data analysis techniques, and justifications for their use.

Study Area

The Korahey Zone contains the study area. The distances between the city and Addis Ababa, the capital of Ethiopia, and Jiggiga, the regional capital of Somalia, respectively, are approximately 405 km and 1015 km. The Korahey Zone had a total population of 312,713 people as of the 2007 Central Statistics Agency (CSA) census, 177,919 of whom were men and 134,794 of whom were women. The majority of these people belonged to pastoral societies. I'm right here. This

region's latitude and longitude are 6° 44' N, 44° 16' E / 6.733° N, 44.267° E, and its elevation is 493 meters above sea level. Kabri Dahar Governorate has a total population of 136,142, of which 77,685 are men and 58,457 are women, according to the Central Bureau of Statistics for 2007. The remaining 50,361 people (6 .99 percent) are pastoralists, while 29,241 people (21. 48 percent) live in cities.

Research Design

For this study, the researchers used descriptive and explanatory research designs. The research design refers to the processes and methods used to gather and analyze the necessary data. The goals a researcher wants to accomplish or the research questions they want to address will determine the study strategy they use (Croswell, 2007). According to (Kothar, 2004), claims that surveys and diverse types of fact-finding enquiries are included in descriptive research.

Sampling Procedure and Determine the sample size.

Several steps of a sampling process were used to create a sample of respondents in the first phase. The Kebri-Dehar region was deliberately chosen because of its widespread application of productive social protection programs. With 11 in the second-stage rural kebeles, five kebeles were randomly chosen as participants and non-participants in a productive social protection program. In the third step, sample 1 obtained from Kebele's office is divided into two groups, and proportions are used.

$$n = \frac{Z^2pqN}{e^2(N-1)+Z^2pq}$$

$$n = \frac{(1.96)^2 \cdot 0.5 \cdot 0.5 \cdot 4577}{(0.05)^2(4577 - 1) + (1.96)^2 \cdot 0.5 \cdot 0.5} = 354$$

The survey was carried out with the help of development agents (DAs) in each of the target. Where: n = sample size; N = total population (1,925); Z = 95% confidence interval under the normal curve (1.96); e = acceptable error term (0.05); and P and q are estimates of the proportion of the population to be sampled (P = 0.5 and p + q = 1).

Sources and Types of Data

To obtain the necessary information for this study, both quantitative and qualitative data were collected from primary and secondary data sources. Demographic, socio-economic, market and institutional-related variables relevant to the study were collected based on the nature of the information needed on various aspects of this study, employing a mixed method of data collection methods to generate adequate and reliable data from the respondents. In addition, data on the type of food items consumed by households in the last seven days were also collected.

Data analysis techniques

The methods of data analysis used in this study were both quantitative and qualitative. To analyze the data, descriptive and econometric methods were employed. Using frequencies, percentages, means, and standard deviations, descriptive statistical analysis techniques were used to discuss the results. To confirm the existence of statistically significant differences and systematic associations between the program and program participants on the hypothesized variables, chi-square tests and t-tests were used. Frequency, percent, and chi-square tests were used to analyze different types of quantitative categorical data. The Social Science Statistics Package (SPSS) version 25, STATA 13, and Excel were used to analyze the data for this study.

Food Security Measurement Models

The household caloric acquisition approach: this model was used to measure household food security, which is measured by daily calorie intake, which is a continuous variable measured by Kcal/AE/day at the household level. To measure the food security of households in the study area, information concerning the types and amounts of food items prepared for consumption by each household in the last seven days preceding the survey was collected.

Econometrics model specification

Binary logistic regression

The binary logit model is defined as follows, according to Gujarati, (1995):

$$P_{i=\epsilon} = \frac{1}{1 + e^{-(\beta_0 + \beta_1 X_i)}} \dots \dots \dots (Y=1/X_i) \dots \dots \dots (2)$$

Equation (1) can be expressed by:

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

Where; $Z_i = \beta_0 + \beta_1 X_i$

If P_i is, the probability of being participated and the probability of not participated in productive safet net program $1 - P_i$, which is expressed, follows in equation 3.

$$\frac{1 - P_i}{P_i} = \frac{1}{1 + e^{Z_i}} \dots \dots \dots (4)$$

Equation 4 is obtained by dividing the participator to non-participator

$$\frac{P_i}{1 - P_i} = \frac{1 + e^{Z_i}}{1 + e^{-Z_i}} = e^{Z_i} \dots \dots \dots (5)$$

Therefore;

Is the odds-ratio (the ratio of the probability that an individual would choose an alternative).

P_i is the probability of household participating ranging from 0 to 1.

Taking natural logarithms of $\frac{P_i}{(1+P_i)} = e^{Z_i}$

$$L_i = \ln \frac{P_i}{(1+P_i)} = \beta_0 + \beta_1 X_{i1} + \dots \dots \dots + \beta_k X_{ik} + \mu_i \dots \dots \dots (6)$$

Where; $Z_i = \beta_0 + \beta_1 X_{i1} + \beta_2 X_{i2} + \dots \dots \dots + \beta_k X_{ik}$

Z_i is a function of k-independent variables β_0 is the intercept or constant term

X_i = ith independent variable K = represents number of independent variables

X_k = Total number of independent variables.

Propensity Score Matching (PSM)

The propensity score matching method was used in this study to analyze the impact of a productive safety net program on rural household food security.

According to Caliendo and Kopeinig (2008), some steps apply in PSM. These steps are predicting propensity

scores, choosing matching algorithms, restricting common support areas, testing the matching quality or balancing tests, and performing sensitivity analysis. These are described as follows:

Step 1: Propensity scores: A logistic model is used to estimate propensity scores for each observation. The advantage of this model is that the probabilities are bounded between zero and one. The dependent variable is dichotomous, taking two values: 1 if an individual participated in a productive safety net, and 0 otherwise. The covariates used to predict treatment assignment using logistic regression are specified as follows:

$$L_i = \ln\left(\frac{p_i}{1 - p_i}\right) = \ln\left(e^{\beta_0} + \sum_{j=1}^n \beta_j X_{ji}\right) = Z_i$$

$$= \beta_0 + \sum_{j=1}^n \beta_j X_{ji}$$

Where L_i is a log of the odds ratio in favor of participating in productive safety net program?

Z_i = participant

β_0 = intercept

β_j = regression coefficient to be estimated

Discussion and conclusions

Descriptive statistics study findings

Age of Household Heads: The mean age of the entire sample of all interviewed household heads was 48.03 years, with a standard deviation of 12.08. As a result, she had an average age difference of 1.48 years between households that were enrolled in the program, which had an average age of 48.80 years, and households that were not enrolled, which had an average age of 47.32 years. The average age of the sample household is 86, while the median age is 21, and vice versa.

Education: The highest grade was ninth grade, with the lowest grade being the 0th. The average educational background of all household heads in the survey area

was 1.74. Thus, with a mean difference of 0.32 years, the average number of school years for households in the program versus those who did not participate was 1.58 for the former and 1.885 for the latter. Between households with and without program participants, they discovered that there was no statistically significant difference in the level of education.

Family Size: There were 5.1706 people living in each household on average in our sample of respondents. When respondents were split into households with and without program participants, the average family size was 5.575 and 4.798, respectively. According to the statistical analysis, there was a statistically significant difference at the level of 5% (Chi2 = -0.426 and p = 0.0061). **Livestock:** The average number of livestock owned by participating and non-participating households in the sample surveyed was 2.979 at TLU. According to the survey's findings, livestock had a mean difference in TLU of 0.062 and 3.01 TLU for program participants' households and 2.948 for non-participating households, respectively. The results of a t-test (t = -0.426 and p = 0.000) also indicated that this difference was not statistically significant.

Extension Contacts: Across all households in the study area, there were, on average, 2,455 extension contacts. There were, on average, 2.13 and 2.74 contacts between households participating in the program and households not participating, with a mean difference of 0.04. The difference was also statistically significant with a probability of 5%, according to a t-test (t=4.7603 and p=0.0000). According to statistical findings of the typical distance across the sample of respondents from the market center, the market distance (km) between participating and non-participating households for a sample of respondents is 15.82 km. The findings revealed that program participants were spaced apart on non-participants was 10.51 km and 20.71 km, with a mean difference of 10.02 km

Table 1: Descriptive statistics for continuous variables

Variables	Total sample		Participant (160)		Non-participant (174)		T-test	P-value
	Households (334)							
	Mean	Std.	Mean	Std.	Mean	Std.		
Age (years)	48.03	12.08	48.80	11.60	47.32	12.51	-1.121	0.2629
Education level (years)	1.74	2.61	1.58	2.498	1.885	2.709	1.040	0.149
Family size	5.1706	2.59	5.575	3.119	4.798	1.920	-2.762	0.0061
Livestock holding (TLU)	2.979	1.37	3.01	1.37	2.948	1.373	-0.426	0.6703
Extension contacts	2.455	1.206	2.13	1.162	2.74	1.175	4.7603	0.0000
Market distance(km)	15.82	15.47	10.51	12.18	20.71	16.55	6.365	0.0000

Determinant of Rural participant households programs Food Security

According to Table 2 of the PSNP participant households program, the binary logit model was estimated to determine the primary factors influencing household decision-making. The dependent variable in the PSNP is a dummy that represents the household program and has a value of 1 for participant household programs and 0 for non-participant household programs. The specified binary logit model's explanatory power is adequate because the model's overall validity has been established and it is statistically significant at a P-value of 0.000. The pseudo-R-square was found to be around 0.1898, indicating that all explanatory significant variables included in the model explained 18.98 percent of the probability of household program participant households. The logit model's overall significance can also be inferred from the LR chi2 (10) = 87.76 and p-value (Prob > chi2) = 0.000.

Table 2. Marginal effect from logit estimation for determinants of participation in PSNP

PSNP	Coef.	Std. Err.	Z	P>z
SEXHH	-.7766406	.2727943	-2.85	0.004
AHH	.0273654	.011947	2.29	0.022
EDL	-.0416035	.0540904	-0.77	0.442
FMS	.1186982	.0526031	2.26	0.024
OFFACTV	.0395364	.2829799	0.14	0.889
LOWSHIP	-.1033271	.0959166	-1.08	0.281
MKINFRMN	.3018203	.261217	1.16	0.248
EXTCONT	-.4575165	.1117969	-4.09	0.000
CRDTSERV	.5167317	.2851846	1.81	0.070
MRKTDST	-.0564234	.011167	-5.05	0.000
_cons	.4784761	.7796265	0.61	0.539

334 obs are present.
 LR chi2(10) 87.76
 Prob > chi2 0.0000.
 -187.33573 log likelihood.
 Pseudo-R2 0.1898

The binary logit model's results demonstrate that, of the 10 explanatory variables used for analysis, five are significantly related to households participating in the program, while the remaining five have a minimal impact and are more useful in describing the variation of households participating in the dependency program in the study area. At a 5 percent significance level, these are the respondent's age, family size, household age, gender, and distance to the market. Other factors like household education, market information access, credit service availability, and off-farm/non-farm activities did not differ significantly between program participants and non-participants (above table).

Age of the household head: The results of the binary logit model indicate that, at a 5% level of significance, the household head's age positively and significantly affects the likelihood of households participating in the PSNP program. When compared to younger people, household heads are more likely to participate in the program as they get older. The outcomes agree with Mohammed (2017).

Family size: The results of the binary logit model indicate that, at the 5% level of significance in the study area, the age of the household head has a positive and significant impact on the household probability. Statistical analysis reveals that, in terms of household size, there is a statistically significant difference between participants and non-participants. Similar to this, focus group discussions reveal that households participating in the PSNP have more family members than non-participating households According to Mohammed (2017) and Mesfin (2018).

Extension contact: The results of the binary logit model indicate that, at the 5% level of regional significance, the age of the household head significantly and positively influences the likelihood of households participating in the PSNP program. When compared to younger people, household heads are more likely to participate in the program as they get older According to ((Mohamed, 2017).

Propensity scores matching model on PSNP's effect on rural household food security

Calculating the propensity score

Using the propensity score matching technique, the impact of a production safety net program on rural households' diets was evaluated. PSM deployment consists of five steps. These include calculating p-scores, selecting a matching method, ascertaining overall support, calculating fit quality and effect, and carrying out a sensitivity analysis. Using the logit model, propensity scores (ps scores) for participating and non-participating households were calculated. This stage gathers all the information on the independent variables that were generated using propensity score matching, which was used to perform the match on a single variable.

A very low R2 value of 0.189, as seen in the table below, signifies that there aren't many differences between the typical characteristics of the sample's households. As a result, it might not be difficult to find a good match between effective safety net participants and non-participants. The results of the point estimates show that the household head's gender, household age, family size, extension contacts, service credit, and marketing strategy have a significant impact on the production safety net program. Negative and insignificant (-187.33573) is the predicted logit intercept According to (Caliendo and Kopeinig, 2005).

Imposing Common Support Region between Participant and Non-Participant

Based on the likelihood of participation, estimates of PSNP participation and propensity scores for all participating and nonparticipating households are created. The general support condition is the next stage in the propensity score matching technique after generating propensity score values for participants and nonparticipants using logit models. As the primary criterion for determining the area of common support between the two groups, eliminate any observations with a propensity score that is higher than the non-maximum participant's and lower than the participant's minimum propensity score (Calindo and Kopeinig, 2008). In order to determine the general area of support where the distribution of propensity scores for the treatment and comparison groups overlap, this is necessary (Shahidur et al., 2010).

Potential scores are estimated for participating or treated households and the corresponding non-participating

(control) household. The estimated propensity scores range from 0.0087 to 0.9118, with a mean of 0.6040 for participants and 0.3691 for those who have not been treated.

Table 3. Shows the estimated propensity score distribution

Group	Observation	Mean	STD	Min	Max
All rural households	334	.4816	.2366	.0087	.9669
Participant	160	.6040	.2055	.0586	.9669
Non-participant	174	.3691	.2058	.0087	.9118

In order to ensure the greatest possible comparability between the treatment groups (PSNP) and the comparison households (no PSNP), local households were used as the samples for matching, as previously mentioned in the table above. Both PSNP and non-PSNP households' propensity score values fall within common support categories. This method's fundamental criterion is the elimination of all observations with trend values in the opposite group that are below the minimum and above the maximum.(Kopeinig, 2005)

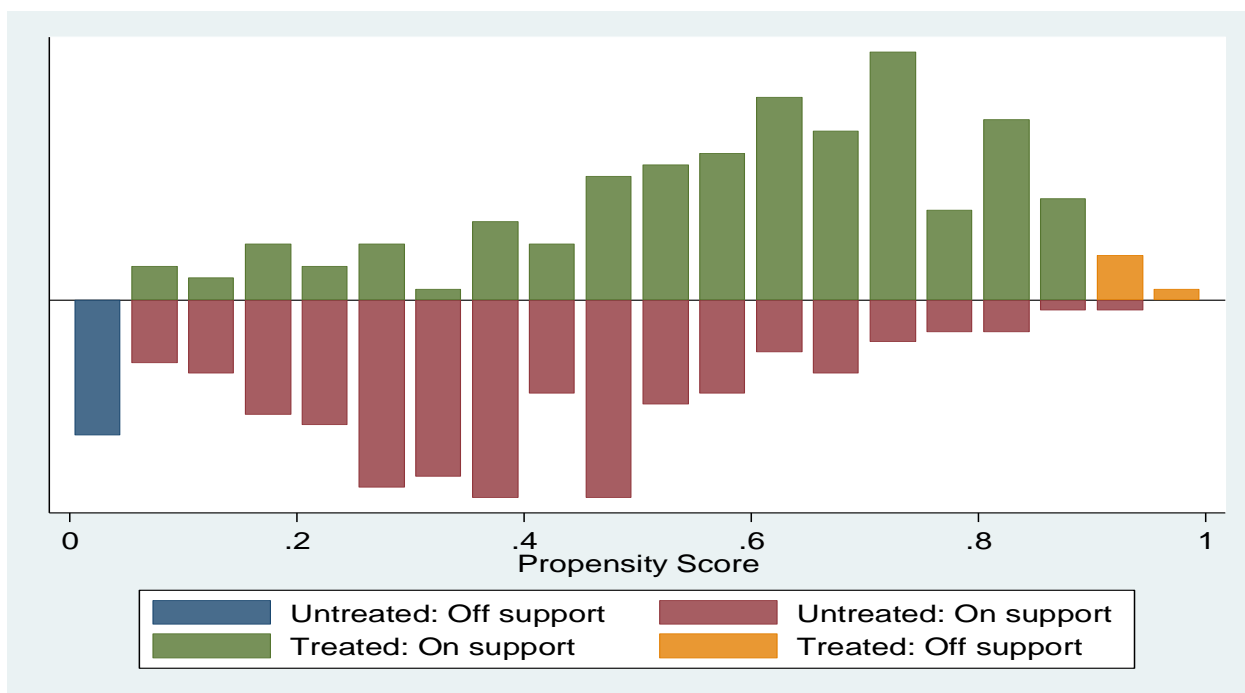


Figure 2. Density distributions of propensity scores using NNM n (4)

Looking for Common Support

It was discovered that 316 observations (147 from untreated participants and 158 from treated participants) were within common support, while 18 observations (13 from untreated participants and 5 from treated participants) were outside the purview of common support and regional analysis. But 316 observations—161 from untreated (non-participants) and 155 from treated (participants)—were within common support and were included in the analysis. These few observations served as the foundation for an analysis of the PSNP program's effects on household food security in the district.

Table 4. Support for Psmatch2

Psmatch ² Treatment assignment	Common support		
	Off support	On support	Total
Untreated (non-participant)	13	161	174
Treated(participant)	5	155	160
Total	18	316	334

Table 5. Balancing tests of the covariates (Pseudo R2, Rubin's B and Rubin's R)

Sample	Ps R2	LR chi2	p>chi2	Mean Bias	Med Bias	B	R	%Var
Unmatched	0.202	93.39	0.000	35.3	30.0	117.7*	1.15	29
Matched	0.031	13.37	0.270	10.6	11.3	42.1*	1.20	29

As a result, the matching procedure generates a highly covariate balance between the treated and control samples that is prepared for use in the estimation procedure. Similar to this, the t-test showed that all covariates were non-significant after adjustment, whereas 8 of them were significant before adjustment. This demonstrates that the standardized mean difference of all covariates used to calculate propensity scores, which was 35 point 3 percent before adjustment, is now only about 10 point 6 percent. Furthermore, the likelihood ratio tests' p-values show that the joint significance of the covariates was always rejected after adjustment but not before. Low pseudo R2, low standardized bias, significantly reduced overall bias, and no significant p-values in the adjusted likelihood ratio test suggest that trends between the treatment and control groups have been successfully identified.

Choosing of Matching Algorithm.

The general livelihood realm, additional comparable estimators were used to match participating and non-participating family units. The best outcomes for a good estimator depend on a number of factors, including testing for equality of means (also known as pseudo-R2) and examining the size of paired samples. The ideal estimator is one that is fitted, controls for all explanatory variables, has a small mean difference between groups, a low pseudo R2 value, and a large fitted sample size. The conformance quality test estimates are based on the following performance standards: The results show that 5-neighbor agreement with 0.1 bandwidth is the best estimator of the available data.

PSM and covariance balance before and after matching are statistically tested

The average standardized bias before and after matching, or the overall bias reduction made possible by the matching procedure, are shown in the table below. For prematched covariates, standardized differences had an absolute value ranging from -0.8% to 115.8%. Following matching, the residual standardized differences of covariates for all covariates fell below the 20 percent critical value suggested by Rosenbaum and Rubin (1985) and ranged from 1 point 2 to 16 point 7 percent.

4.3.6. The average treatment effects (ATT) are estimated.

The impact of production safety net programs on rural households' access to food is demonstrated in this section. As a result, the mean therapeutic effect (ATT) of PSM was calculated with a neighbor of 0.5. The corresponding results only provide proof that production safety net programs have a statistically significant effect on rural households' access to food. Thus, the program participant's 214.5 kcal/EA/household-day increases her PSM model results in Table 6 below, showing that households taking part in the production safety net program have a true average wage guarantee means that having a household's food security affected in any way by participation in production safety net programs. This suggests that under the same covariates, the production safety net program has an impact on food security of 214.5 kcal/AU. The fact that households choose to take

part in the program seems to make them relatively safer and less prone to food insecurity than households who do not is encouraging for ATT.

Table 6. Impact of program participant households PSNP on household resilience to food security

Variable	Sample	Treated	Controls	Difference	S. E	T-stat
Kcal	Unmatched	2726.523	2451.010	275.512838	37.5	2.26
	ATT	2730.041	2515.652	214.388826	165.5	1.30

Sensitivity Analysis

It is becoming more and more important for researchers to test how robust their findings are to changes in certain presumptions. Sensitivity analysis can be used to address this problem because non-experimental data cannot be used to estimate the level of selection bias. To test the putative ATT's sensitivity to departures from the CIA, Rosenbaum (2002) suggests employing the Rosenbaum boundary approach.

Table 7. Rosenbaum Sensitivity Analysis for Hidden Bias

Gamma (Γ)	sig+	Sig -	t-hat+	t-hat-	CI+	CI-
1	0	0	2484.9	2484.9	2350.44	2628.7
1.25	0	0	2364.47	2614.34	2233	2767.48
1.5	0	0	2267.76	2724.09	2144.79	2878.3
1.75	0	0	2193.02	2816.38	2074.93	2966.75
2	0	0	2132.69	2894.05	2018.08	3041.87

Recommendations and Conclusion

Conclusion

In order to find out how the production safety net program affects rural households' access to food, four rural areas in the Kabri Dahar district of the Somali Regional State of Korahey were randomly selected out of a total of 11 rural areas. After thorough research, design was used. A multi-stage sampling method was used to collect data from the 334 household heads that were sampled.

Results from descriptive statistics reveal a statistically significant difference in household characteristics, such as age, gender, family size, distance from the closest market, and extended contact, between program participants and non-participants. However, there were no appreciable differences between participants and non-participants in terms of other factors like household education, market information access, financial services access, and off-farm activity. Aside from age, family size, and distance to the closest market, the logit model's findings also revealed contact information for Extension. was significantly and negatively affected by PSNP participation, whereas household education status, access to market information, access to credit services, and off-farm activity were not significantly different between program participants and non-participants.

The findings show that a total of 194 (58.80%) of the sampled households were found to be food secure, providing the minimum daily calorie recommendation, while 140 (41.92%) were food insecure, not meeting the minimum daily calorie requirement. This was established by using a cut point of a minimum of 2200 kcal/AE/day.

The outcome of the impact estimation indicates that the study area's household food security was improved by the productive safety net program. Compared to non-participating households, rural households that took part in the program consumed 214.5 kcal/AE/day more food on average. In comparison to non-participants, program participants were older, had larger households, and lived farther away from local shops and extended networks. Participating families were more likely to match their age, gender, family size, and distance from the closest marketplace and extension contact person. In order to address the issue of food scarcity, the study site's PSNP program is essential. The production safety net program has had a significant positive impact on participants' food security in the study area. These studies support the idea that PSNPs significantly improve household food security.

Recommendations

The following recommendations are provided in consideration of the study's findings mentioned above:

- Household length becoming substantially longer has an effect on family participation in PSNP. A family with a large age range, a large circle of relatives, a long distance from the nearest marketplace, and extended touch may be eligible to participate in an application. As a result, it is far from optional to take into account personal family planning in any improvement interventions carried out by authorities and non-governmental organizations that may manipulate rapid population growth to provide solutions to the family meals security problem.
- Finally, given the sure diploma of versions of application effect studies, if similarly conducted studies with extra scope and in a one-of-a-kind region examined the effect of PSNP and different meal protection applications on meal protection, it would be better.

Future researches

The study included a limited number of households and did not include all important factors and other aspects of food security. It focuses on how the producer safety net program affects household food consumption and examines the variables that affect PSNP program participation. Accurate data on food consumption in the research area can be difficult to collect because rural households frequently struggle to recall all of their consumption details. It's possible that some participants and non-participants will be unwilling to provide an honest response to inquiries about their animals. This limitation may arise due to a lack of information and awareness in the rural household study areas. Regardless of these limitations, it is anticipated that the study will create valuable information that may not be advantageous to various stakeholders interested in the field.

Acknowledgments: The Kebri Dehar University provided financial and logistical support, for which the authors are grateful. The interviewers, local managers, and interviewees were all thanked for their contributions

Contributions of the author: This research paper was written by all authors

Funding: The Research-Publishing Department at KEBRI DEHAR UNIVERSITY and the Technology Transfer department provided funding for this study as part of their underfunded projects for 2022

Interests conflict: Regarding the publication of this article, the authors affirm that there are no conflicts of interest.

Ethical Consideration: One of the most significant aspects of research is ethical considerations. The researchers was approach the research participants first by seeking their willingness to engage in the study, and then identify themselves, and all research participants involved in this study was properly informed about the study's goal and their willingness to participate in it.

References

- Abdulkarim, A. 2014. Impact of Productive Safeneteay Net Program onHouseholds' Food Security: The Case of HarshinWoreda, Somali Regional State, Ethiopia
- Abduselam A. (2017), "Food Security Situation in Ethiopia: A Review Study. International Journal of Health Economics and Policy". Vol. 2, No. 3, 2017, pp. 86-96. doi: 10.11648/j.hep.20170203.11..
- Andersson, C., Alemu, M. & J, S. 2009. Impacts of the productive safety net program in Ethiopia on livestock and tree holdings of rural households. Discussion Paper Series. Environment for Development (EfD) Initiative. EfD DP 09-05.
- Anderson, S. and Elisabeth, F., 2015. USAID Office of Food for Peace Food Security Country Framework for Ethiopia FY 2016–FY 2020. Washington, DC: Food Economy Group.
- Ayalneh Bogale and Wubshet Genene2012.Impact of Productive Safety NetFinanced Livestock Credit on Food Security and Poverty Status of Rural Households in Ethiopia: A Simulation Approach
- Aman Tufa, Adam Bekele and Lemma Zemedu. 2014. Determinants of smallholder commercialization of horticultural crops in Gemechis district, West Hararghe zone, Ethiopia. African Journal of Agricultural Research, 9 (3): 310-319
- Anwar Ahmed. 2015. Impact Assessment of PSNP Program on Household Food Security: The Case of Fadis District, East Hararghe Zone of Oromia Regional State. M.Sc. Thesis, Haramaya University, Haramaya, Ethiopia..

- Bryson, A., Dorsett, R. & S, P. 2002. The use of propensity score matching in the evaluation of labour market policies, working paper no. 4, department for work and pensions.
- Caliendo, M. and Kopeinig S. (2008): "Some Practical Guidance for the Implementation of Propensity Score Matching", *Journal of Economic Surveys*, 22(1), 31-72.
- CSA 2007. Population census. CSA: Addis Ababa.
- Devereux, S., Sabates-Wheeler., Mulugeta, T. & Hailemichael, T. 2006. Ethiopia's Productive Safety Net Programm. Trends in PSNP(Productive Safety Net Programme) Transfers with in Targeted Households, Final Report, 10 August, 2006. Institute of Development Studies, Sussex, UK Indak International Pvt. L. C., Addis Ababa, Ethiopia.
- FAO 2005. (Food and Agricultural Organization)Assessment of the World Food Security Situation. FAO: Rome
- FAO,2017.EmergencesitationreportethiopiaEthiopia%C2%A0_%20FAO%20in%20Emergencies.html
- FAO 2017 EmergencesitationreportethiopiaEthiopia
- FAO 2008. Food Security Information for Action: Practical Guides. EC FAO Food Security Programme, Rome
- FAO 2010. Crop and Food Security Assessment Mission to Ethiopia. FAO: Rome.
- FAO,2018.The State of Food Security and Nutrition in the World 2018. Building climate resilience for food security and nutrition. Rome, FAO.
- FSIN 2017. gobal report on food crises. fsin-secretariat@wfp.org.
- Gilligan, O., D., John, H. & Alemayehu, S. 2008. The impact of Ethiopia's Productive Safety Net Programme and its linkages. IFPRI: Washington DC
- Gujarati, D.N. (1995) *Econometrics*. 3rd Edition, McGraw-Hill, Inc., New York.
- Ingela T. Flatin and Udaya S. Nagothu [Eds.], (2017). —Food Security in the Context of Global Environmental and Economic Change! In Food Security and Development: Country case Studies. London and New York: Routledge.
- Kothari, C.R. 2004. *Research Methodology: Methods and Techniques*, 2nd Edition. New Age International, New Delhi, India.
- Mesfin W, (2018). The contribution of Productive Safety Net Program to ruralhousehold food security enhancement in kuyu woreda,Central ethiopa.
- Mohamed, A. (2017), 'Impact of Ethiopia's Productive Safety Net Programme (PSNP) on the Household Livelihood: The Case of Babile District in Somali Regional State, Ethiopia',*InternationalJournalofEconomy,EnergyandEnvironment*.At:<http://dx.doi.org/10.11648/j.ijee.20170202.12>
- Mohammed, U. 2013. Determinants of Safety Net Program Beneficiary Households' Graduation and their AssetAccumulation: The Case of Bugna Woreda, NorthWollo Zone, Amhara National Regional State ofEthiopia
- Rosenbaum, P. R., and Rubin, D. B. 1985. Constructing a control group using multivariate matched sampling methods that incorporate the propensity score. *The American Statistician*, 39(1): 33-38.
- Shahidur, R., Gayatri, B. & Hussain, A. 2010. *Handbook on Impact Evaluation, Quantitative Methods and Practices*, Washington Dc.
- Tadele, M. 2011. Impact of productive safety net program on asset accumulation and sustainable land management practices. M. Sc. Thesis. Haramaya University.
- USAID (2012) (United States Agency for International Development).Productive Safety Net Program (PSNP) Retrieved from USAID Ethiopia.usaid.gov/programs/feed future Initiative/projects/productive-safety-net-program-psnp.
- WFP 2017. Emergence sitation report ethiopia.
- Yibrah, H. (2010). Impact of Productive Safety Net Program on the Rural Households asset Protection and Consumption. Submitted in Partial Fulfillment of the Requirements for the Award of Master of Science Degree.