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Impact of Productive Safety Net Program on Rural Household Food Security in Somali Regional State: A Case of Kebri Dehar District, Ethiopia

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Abstract

The study specifically evaluated household food security, factors influencing the decision 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 of households. Primary data were collected from 334 households in four barbecue samples in Kebri Dehar district using 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 kilocalorie intake between participants and nonparticipants.

1. Introduction

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; global and global (Ingela and Nagothu, 2017). However, problems such as family or man or woman supply, dietary quality, and environmental sustainability have been not noted (Ingela and Nagothu, 2017). The 1996 World Food Summit added a extensively customary definition of meals safety as section of this speech: "Food safety exists when all human beings constantly have get admission to adequate, safe, and nutritious meals for healthful and lively lives (WHO, 2010). In phrases of meals security, Ethiopia is one of the poorest international locations in Sub-Saharan Africa. A giant percentage of the country's populace suffers from persistent and power meals insecurity (Anderson al., 2015). Many elements make contributions to rural poverty and persistent meals insecurity. The important motives of meals insecurity in Ethiopia are drought and animal diseases, restrained rural infrastructure, a very susceptible agricultural technical base, constrained get entry to fundamental services, and fluctuating file costs (FISN, 2017).

The population's meals insecurity is anticipated to upward push 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 meals crises and famines, and the response to meals insecurity is regularly dominated by way of the meals emergency response. Between 1994 and 2005, common of 5 million Ethiopians have been declared

inclined and in want of assistance. However, a massive share of households get hold of emergency meals assistance, take part in public works projects, and do no longer go hungry each and every year, however are often meals insecure. Because of constrained agricultural manufacturing and poverty, they face predictable annual meals shortages.

As a result, their meals safety has deteriorated over time, in spite of a long time of large meals aid. Instead, reliance on meals useful resource has progressively extended over time, as has the wide variety of Ethiopians experiencing continual meals insecurity (Devereux et al. 2006). The purpose of the Safety Net Program is to reallocate assets to chronically food-insecure households and to enhance long-term options for food-insecure households (USAID, 2012). Its two strategies of switch to negative households are labor-intensive public works (TP) and long-term direct help (PDS).

1.2 Statement of problem

The Food Security Program used to be created to tackle the difficulty of meals manufacturing whilst additionally enhancing people's lives and assuaging poverty. Recognizing its significance, the authorities have taken a quantity of steps. Beginning in 2005, the Ethiopian authorities and donor companies carried out a new kind of protection Productive Safety Net Program (PSNP) ambitions to minimize persistent meals insecurity, asset depletion, and productive funding Overcoming long-term meals insecurity (Gilligan et al., 2008).

The application is aimed at her 8.5 million people, who account for 10% of Ethiopia's population. These human beings are chronically meals insecure; 60% of them stay in pastoral areas, and their buying strength has been decreased due to farm animal's losses. The final 40% are affected with the aid of erratic rainfall, which reduces crop manufacturing (WFP, 2017)

In the Somali region, the Ethiopian authorities has prepared to assist negative rural households registered in chronically food-insecure districts. A learn about on the effect of productive protection internet packages (PSNP) on family livelihoods with the aid of (Mohamed, 2017): Babile Case observed that productive security internet packages had a fantastic have an effect on family meals safety is displaying Various research have been performed on the outcomes of PSNP in special fields and at exclusive times.

The findings of these investigations had been differing. Food safety research, on the different hand, necessitates a multidimensional shift supported by using well-informed lookup disciplines. By assessing the influence of PSNPs on meals safety in rural households, this studies about provides to the current build of knowledge. As a result, the reason of this find out about is to fill understanding gaps about family meals security, PSNP determinants, and effects on meals protection in rural households of collaborating households.

1.3 Objective of the study

The primary aim of this study was to assess the impact of productive safety net programs on food security in rural households. 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 of Rural Households.
3. Assessing the Impact of Productive Safety Net Programs on Food Security of Rural Households.

2. Empirical literature

Results of a find out about carried out via Taye (2016) confirmed that presence of a massive family, age of the family head, dependency rate, and cattle fame considerably influenced PSNP participation. Of these variables, household size, family head age, and dependency fee had a high quality and full-size impact on the probability of a family being enrolled in her PSNP program, whilst land tenure had a poor and good sized effect. The equal learn about with the aid of Abdusalem (2017) observed 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 was significant negative effects affected participation in productive safety net programs. According to Abdukarim (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) gender of family head, educational stage of family members, meals protection issues, and frequency of contact with improvement employees had been related with family safety net in productive programs I've found that it makes a big difference. Additionally confirmed a high-quality affiliation between big household measurement and participation in the PSNP, suggesting that small family measurement was once related with larger meals demand compared with smaller households excessive and may additionally be related with a greater possibility of meals insecurity. A study by snake (2015) also pointed out that the further the distance from the market, the more likely households are to be involved in production security.

According to Ayalneh and Wubshet (2012) livestock holding positively correlated with well- being and negative relation with program participation, and having right to use to credit service have encouraging correlation through participation in program. The study undertaken by Yibrah (2010) indicated that as age of house hold increase, probability being participate in productive safety net program were increase and negatively effect on participation in program.

The find out by Aman (2014) shows that access to credit service, extension contact, number oxen, livestock holding, cultivated land, and distance from market were significantly affect participation in productive safety net program. Those among those variable distances from market were positive and significantly affect participation of PSNP while access to credit service, extension contact, number oxen, livestock holding, cultivated land were negatively and significantly affect participation in program. Similarly, the study by Anwar (2015) indicated that age of family head educational, household size livestock holding, extension remoteness and market distance were significantly affect participation in productive safety net program.. Also the study under taken by Mesfin (2018) indicated that educational level of house hold were negatively and significantly affect participation in program.

2.1 Conceptual framework

It is clear that several factors may help to explain the Determinants of household food security and rural Productive Safety Net Programme (RPSNP). Based on the objective of the study, the independent variables selected to achieve the ultimate objective of the study are broadly categorized in to socio economic, institutional and demographic factor. The relationship between two variables of this find out.

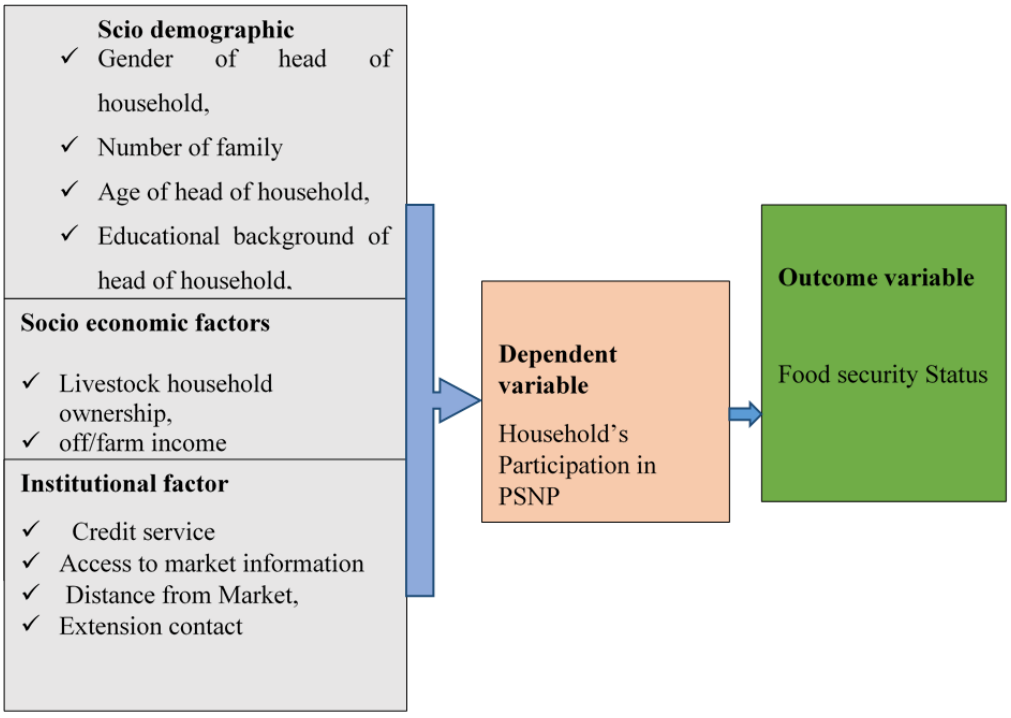

Figure 1: Conceptual Frame work of food security and UPSNP

Source: Own design based on literature review

3. Materials and Methods

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.

3.1 Analyzing the study area

The Korahey Zone contains the study area. The distances between the city and Addis Ababa, the capital of Ethiopia, and Jigjiga, 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, or 36 point 99 percent, are pastoralists, while 29,241 people or 21 point 48 percent, and live in cities.

3.2 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 Kebele; Five Kebeles were randomly chosen as participants and non-participants in a productive social protection program. In the third step, sample1 obtained from Kebele's office is divided into two groups and proportions are used.

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

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

3.3 Sources and types of data

The required data for this study was gathered from primary and secondary data sources using both quantitative and qualitative data. In accordance with the different types of data required for the various aspects of this study, relevant demographic, socioeconomic, market, and institutional variables were gathered and analyzed using various techniques. Assemble various data. To produce respondents, we offered accurate and comprehensive data. Data on the foods that households consumed over the previous seven days was also gathered. In order to compile timely and pertinent secondary data for the study, secondary data sources are also assessed and reviewed.

3.4 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. Key informant interviews, focus groups, and field observations were used to gather qualitative data, which was then simultaneously and thematically analyzed using quantitative data analysis techniques like narrative and description. The Social Science Statistics Package (SPSS) version 25, STATA 13, and Excel were used to analyze the data for this study.

3.5 Binary logistic regression

The dependent variable has a binary value of 1 if a household takes part in the program, otherwise it has a value of 0. A logistic regression model is used to identify the variables that affect the success of a safety net program. With Y acting as the dependent variable and X acting as the independent variable, a binary logistic regression model was used in this particular investigation. According to Gujarati (1995), the logistic distribution function was used to describe the model.

$$Pi=\varepsilon\ (Y=1/\ Xi) = 1/\ (1\ e\text{^}\ (-(\beta 1\ \beta 2xi) \quad (1)$$

In the logistic distribution equation, Pi is the independent variable and Xi is the data that indicates the likelihood of a person's participation (with the option of having 1 or 0 values). When Zi is used in place of 1 2Xi in equation 1, the following equation is created:

$$Pi=1/(1\ e)\ (-Zi) \quad (2)$$

While P I lies between and, Z I lies between and. In cases where Pi is the probability that a household will take part in the PSNP, 1-Pi is the probability that it won't. Equation 3 can then be used to provide the following explanation for the potential for non-participants:

$$1-Pi=1/\ (1\ e\text{^}Zi) \quad (3)$$

Calculated by dividing program participants by non-participants, equation 4 reads as follows:

$$Pi/\ (1-Pi)=(1\ eZi)/(1\ e(-Zi))=eZi \quad (4)$$

Equation 1 is produced when both sides of the equation's natural logarithm are written.

$$Li=\ln(Pi/(1-Pi))=Zi=1\ 2Xi \quad (5)$$

This results in a liberalization of the non-linear logistic regression model based on both its parameters and variables. Models like those are known as "logit models" and "L" is referred to as "logit" (Gujarati, 2003). Equation 1 is employed in this instance for the right transformations:

$$Pi=(Y=1/(Xi)=1/(1\ e-(1\ 2X1\ 3X2\ k\ Xk)) \quad (6)$$

Divided by non-participants, equation 4 is obtained as follows:

$$Pi/\ (1-Pi)=(1\ eZi)/(1\ e(-Zi))=(1\ eZi)/eZi. \quad (7)$$

Equation 1 is created by writing the natural logarithms of both sides of the equation.

$$Li=\ln(Pi/(1-Pi))=Zi=1\ 2Xi \quad (8)$$

As a result, the nonlinear logistic model's two parameters liberalized the variables in the regression model. A model similar to the "logit model" is called "L" (Gujarati, 2003). In this instance, the right transformation is achieved by applying equation 1.

$$Pi=(Y=1/(Xi)=1/(1\ e-(1\ 2X1\ 3X2\ k\ Xk)) \quad (9)$$

The logit model's key terms are odds and odds ratio. The ratio of actual events to hypothetical ones is known as the odds. The ratio of two odds, or a probability to another odd, is known as an "odds ratio," on the other hand. Her two probabilities of a PSNP participant and a PSNP non-participant are combined to form the proportional probability of an event in Equation 4. Understanding that probability, odds, and logits are all three different ways of describing the same thing is crucial (Menard, 2002).

$$Zi=\beta o+\varepsilon\beta iX+Ui \quad (10)$$

Zi is a variable in the explanatory function with the values 1, 2, 3, etc.
o = intercept I is the calculated logit parameter or estimated regression coefficient.
Error term U is. Xi = vector of household characteristics

4. Discussion

4.1 Descriptive statistics study findings.

4.1.1 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 from 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 (table 1).

4.1.2 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 (table 1).

4.1.3 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 statistical analysis, there was a statistically significant difference at the level of 5% (Chi2 = -0.426 and p = 0.0061) (table 1).

4.1.4 Livestock: 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 was 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 (table 1).

4.1.5 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).

Table 1: Descriptive statistics for continuous variables

Variables	Total sample Households (334)		Participant (160)		Non-participant (174)		T-test	P-value
	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

4.2 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 households program and has a value of 1 for participant households programs and 0 for non-participant households 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 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).

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, 5 are significantly related to households participating in the program, while the remaining 5 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 services availability, and off-farm/non-farm activities did not differ significantly between program participants and non-participants (table 2).

4.2.1 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. Compared to younger people, household heads have a higher likelihood of participating in the program the older they are. The outcomes agree with Mohammed (2017) and Hailu 2022) (table 2).

4.2.2 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) (table 2).

4.2.3 Extension contact: The results of the binary logit model indicate that, at the regional significance level of 5%, the age of the household head significantly and positively influences the likelihood of households participating in the PSNP program. Compared to younger people, household heads have a higher likelihood of participating in the program the older they are. It's a match, to ((Mohamed, 2017)) and (Hailu1, 2022) (table 2).

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

4.3.1. 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/effect, and carrying out a sensitivity analysis. Using the logit model, propensity scores (pscores) 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 2), 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 (Caliendo and Kopeinig, 2005).

4.3.2 Imposing common support region between Participant and Non-Participant

Based on likelihood to participate, estimates of PSNP participation and propensity scores of all participating and nonparticipating households are created. The general support condition is the following 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).

The estimated propensity scores range from 0.0087 to 0.9118 with a mean of 0.6040 for participating or treated households, while they range from 0.0087 to 0.3691 for the corresponding non-participating (control) household. The general support's range will then be from 0.0586 to 0.9118. To put it another way, the matching procedure eliminates households with predicted propensity scores between 0.0586 and 0.9118(table 3).

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	.96698
Non-participant	174	.3691	.2058	.00876	.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 Limited. 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) (table 3).

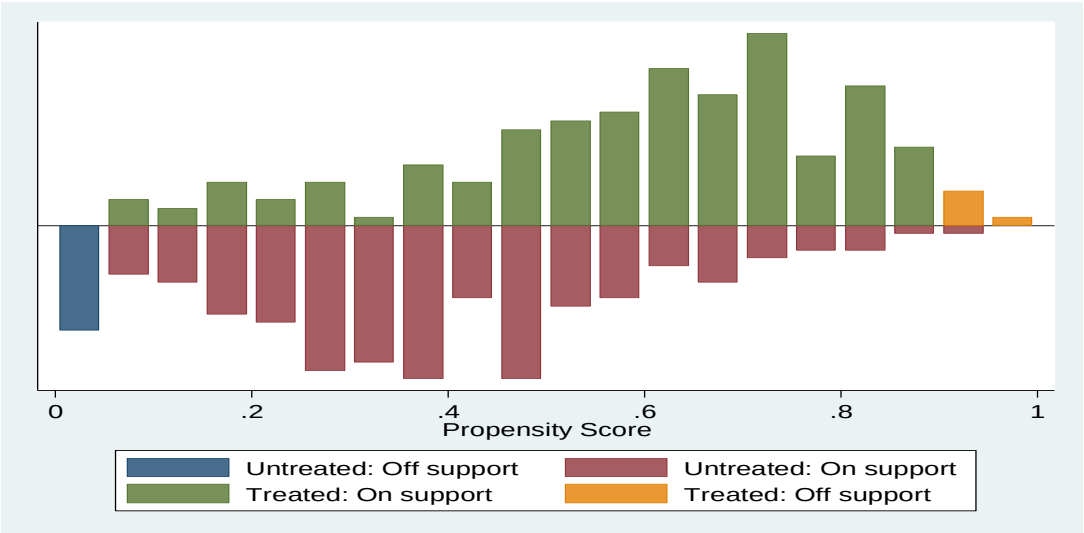

Figure 2: Density distributions of propensity scores using NNM n (4)

4.3.3 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).

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

4.3.4 Choosing of matching algorithm

the general livelihood realm, additional comparable estimators were used to match participating and non-participating family units. In accordance with (Dehejia and Wahba, 2002), 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 (table 4).

4.3.5 PSM and covariance balance before and after matching are statistically tested

The next step after selecting the best matching algorithm is to use that algorithm to check the balance of propensity and covariates using various techniques. Consideration is given to a number of test procedures when determining the balance of estimates, including the t-test and chi-square test, mean equivalence for variable joint significance, and reducing mean standardization bias between concordant and discordant households.

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 (table 5).

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 (table 5).

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

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).

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

4.3.7 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. According to Dehejia (2002), sensitivity analysis is a conclusive diagnostic carried out to examine the sensitivity of assessed treatment effects to hidden traits that affect both treatment attributes and outcome variables. To test the putative ATT's sensitivity to departures from the CIA, Rosenbaum (2002) suggests employing the Rosenbaum boundary approach.

An unobserved variable has zero impact on a study if it has no impact on that study. As a result, only the characteristics that can be observed can predict whether someone will participate though two biases with comparable observed characteristics have different chances of being treated if there is an unobserved bias. A sensitivity analysis was carried out in accordance with this theory. Results Table below demonstrates how the unobserved covariate 0.5 (100%) was identified while gamma varying the probabilities of households participating in the program and his PSNP households not participating in the program (table 7).

There was no hidden bias in the analysis's findings regarding the impact of PSNP on food security in participant households. The p-critical values were statistically significant for outcome variables computed at various levels of gamma's critical value. This study's impact estimate (ATT), it can be deduced, is only affected by the PSNP of the participants and is not sensitive to unobserved bias (table 7).

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

5. Conclusion

In order to find out how the production safety net program affects rural households' access to food, 4 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 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, 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 improved household food security.

6. Recommendations

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

2. 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.

3. 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.

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