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Impact of Cooperatives on Poverty Reduction: The Case of Licha Hadiya Farmers' Cooperative Union in Lemo Woreda; Hadiya Zone, SNNPR, Ethiopia

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Abstract
Prevalence of poverty has been a common phenomenon in Ethiopia. The prevailing operation of the conventional financial institutions of Ethiopia is inefficient in providing multi services to the rural household. The challenge facing Ethiopia today is to reduce poverty since its' multi-dimensional characteristics among rural household. One of the economic policies of the country considers support cooperative societies in order to help rural household within its multi-dimension activities. Study on poverty reduction impact of Licha Hadiya farmers' cooperative union on rural household in the cause Lemo district. Primary data in this study was collected through structured questionnaire based on 75 members' respondents and 95 non-members respondents from purposively selected 4 kebeles in Lemo woreda. Total 170 household were selected by using two stage sampling method. Secondary data were gathered from Licha farmers' cooperative union, primary cooperative of kebele and from different organization those Hadiya zone cooperative and marketing sectors, Lemo woreda cooperative and marketing sectors. Both are quantitative and qualitative in nature. Data analysis is carried out with the help of various descriptive and econometric techniques i.e logit model. Propensity score matching method was employed to achieve the objective of the study that to assess poverty reduction indicators outcome between cooperative members and non-members. Based on PSM estimation results of study were cooperative have significant impact on rural house hold poverty reduction in most above listed impact indicator outcome variable was significantly different among members and nonmembers of cooperative. In this case cooperative have positive and statistically significant impact on participant households those income from crop sells, durable home assets, saving and house hold food expenditure. In view of such evidences, further promotion, deepening, strengthen and supporting of agricultural cooperative and its service recommended.
Keywords: Cooperative, Impact evaluation, Poverty, propensity score match.

CHAPTER ONE
1. INTRODUCTION
1.1 Back Ground
Poverty remains a stark reality to more than 2.5 billion people around the world who live on 2 dollars a day or less (Watkins, 2005). Out of the total numbers of poor in the world 49% are in sub-Sarah Africa, 32% in South Asian, 15% in East Asian and pacific, 11% in Latin America and Caribbean, 5% in Eastern Europe and Central Asian and 2% in Middle East Africa. The implication is that Sub-Sahara Africa home of poverty. . That most of countries case of the poverty is low reproductive agricultural land in rural area, low adoption of improved agricultural technology and sufficient supportive rural institution. This situation leads to many worries for rural house-holds on low health facility, high illiteracy and low quality of living standard (Hulme and Mosley, 1996).

Ethiopia's poverty-stricken economy is based on agriculture, accounting for half of GDP, 90% of exports, and 80% of total employment (CSA, 2007). Moreover, in Ethiopia rural household are embraced in food insecurity, vulnerability to poverty that suggestively caused by low land holdings, low level of asset accumulation, weak rural institutions, poor access to essential services and low market access (Messele, 2002). With regard to this harshness of rural poverty Ethiopia government recently have been struggling to reduce poverty. This is the reason why many organizations including cooperatives are established and they have providing multi-service for their member spatially on agricultural activities, in adoption of new agricultural technology and provide opportunity for poor people to rise their income (ILO, 2007). Also empower them by direct and indirect to meet several MDGs such as education and reduce children mortality (Birchal, J (2004)). Cooperative in other case improve saving habit and provide way out of poverty for rural household (Smith, S and Ross, C. 2006).

Now a day, there is assertion in Ethiopia about the potential role of cooperatives in terms of smallholder commercialization. Some success stories already achieved include direct export of coffee, oilseeds and vegetables to markets in Europe and the USA by cooperative unions in which rural households are represented as members through primary cooperatives. More specifically, agricultural cooperatives play an important role in food production and distribution, and in supporting long-term food security. They create rural employment, access to marketing, negotiation better price and providing agricultural input at lower prices and better access to information, agricultural technology innovation and extension service (IFAD, 2013). Those show growing

evidence of cooperatives success across countries particularly in area of rural agricultural activities.

In the Ethiopian context, cooperative have been established and operating with ultimate goal on livelihood development and poverty reduction by setting sub-objective that collectively to solve economic problem and improve living standard of members (Ethiopian proclamation No 147/1998). Base on those goals and strategy cooperative had preforming multi-dimensional activities to improve living standard of rural poor household and to reduce poverty. However, empirical evidence on the livelihood development and poverty reduction impact of cooperatives is scarce in Ethiopia yet to be established (Getnet and Annulo, 2012). Few cases of empirical study include Francesconi and Heerink (2010) and also Bernard et al. (2008) evaluate impact of cooperative on smallholder commercialization. Those two study focus only commercialization impact of cooperative conversely restricted for poverty reduction impact evaluation. Getnet and Annulo (2012) evaluate impact of cooperative on livelihood development and the result indicate positive impact on livelihood development but emphasizes limited outcome. Other study that taken by Alemu (2011) result demonstrate positive role of cooperative on rural household. Conversely, in this study have some limitation that on evaluation tool and investigator use only participant data to evaluate role of cooperative. Those implies that there is limited emphasizes on poverty reduction impact analysis and having some research gap on cooperative impact evaluation area. Moreover, no impact assessment study under taken on LHFCU to evaluate whether or not its intervention bring change on rural households. Therefore, investigator was initiated to fill those gaps by investigating impact of agricultural cooperative on rural household poverty reduction through poverty reduction indicators at Lemo district.

2. STUDY DESIGN AND METHODOLOGY

The study were conducted in Lemo woreda which one of the 11 woreda in Hadiya Zones in the SNNPR. Its altitude is 1900 m.a.s.l and daily temperature ranging from 18 0^c and 27 0^c. Agricultural activities mainly, mixed agriculture is well known and practiced by the farmers in area (LWFEDO, 2015). Multi-stage sampling technique is conducted to define sample size from the target population. In this case two stages sample design procedure were adopted. Based on this four kebele were selected.

Researcher take ideal 10% of from this total population of sample *kebeles* by considering time and budget limitation to determine sample size. Therefore, 170 sample size (n) were taken for this study because this fulfill minimum ideal sample size household for reliable results. From this sample size research take 75 treated and 95 controlled groups to increase matching probability among the group.

The primary data for this study were collected from selected *kebeles* both LHFCU participant and non-participant respondents on Lemo *Woreda*. Secondary data were collected from government offices LHFCU main office and from those selected *kebeles* primary multi-purpose cooperative centers. Primary data were collected by means of structured questionnaire which pre-tested prior to its use in the field.

In this study both descriptive statistics and econometric model were employed. Propensity score match employed to found quality match covariate among cooperative participants and non-participants for the purpose of difference compression also to quantify important cooperative impact indicators empirical results.

2.1. Propensity Score Matching

Explicated, model is the propensity score which conditional probability of receiving a treatment given pre-treatment characteristics, X (individual household level characteristics).

$P(X) = Pr\{D = 1 \mid X\} = E\{D \mid X\}$…….....(1)

Where D = {0, 1} is the binary variable indicating whether a household are member of cooperative (1) or not (0) and X is the multidimensional vector of treatment characteristics relatively stable household characteristics in own context.

In this study logit model was conducted to predict the probability of each household participating in the program as a function of observed household characteristics used sample of the cooperative participants and non-participant. In the logit model the participation of the households was treated as dependent variable which takes the value of 1 for the household that participate in the cooperative and 0 otherwise the same to as shown above.

$$P = E(Y = 1 /Xi) = \frac{1}{1+e^{\beta 0+\beta iXi}} \text{---------- (2)}$$

$$Li = \ln\left(\frac{P_i}{1-P_i}\right) = Zi = \beta_0+\beta_1 X_1+\beta_2X_2+\beta_3X_3+\beta_4X_4+\text{-----}+\beta_nXn \text{ ----------(3)}$$

Where; Pi = is a probability of being participated in the program, $Z\,i$ = is a function of explanatory variables (X i) which is also expressed as, β0 = is an intercept, β1, β2,· …βn = are slopes of the equation in the model, $L\,i$ = is log of odds ratio which is not only linear in $X\,i$ but also linear in the parameters, ($X\,i$) = observable characteristics if the disturbance term (*ui)* is introduced to the logit model.

$$Zi = \beta o + \beta_1X_1 + \beta_2X_2 + \beta_3X_3 + \cdots + \beta nXn + ui \text{---------- (4)}$$

Here main question is how far household get improvement and reduce poverty favor in terms of poverty

indicators as a result of participating in cooperative relative to household that not participating in cooperative for this researcher use average effect of treatment on treated(ATT).

Therefore, impact of cooperative based on PSM is defined as follows by ATT

ATT= $E\{Yi - Yo|D = 1\}$

ATT=$E(Yi - Yo|D = 1) = E(Yi|D - 1) - E(Yo|D = 1)$ ---------- (5)

Where, Yi =the outcome in the treated condition (improvement for members household); Yo=the outcome in the control condition (improvement for nonmembers household; and D= indicator variable denoting use of cooperative service (i.e. D=1, household that member of cooperative and D=0, household not a member of cooperative). $E(Yi|D - 1)$is expected outcome; $E(Yo|D = 1)$ is the counterfactual outcome. In order to estimate ATT using the E[Y0/D = 0] mean outcome of untreated individuals lead to a self-selection bias because of the reason already stated above.

Therefore ATT analyzed as:

E [Y 1 /D = 1] - E [Y 0 /D = 0] = ATT+E [Y 0 /D = 1] - E [Y 0 /D = 0] ----------(6)

E [Y0/D = 1] - E [Y0/D = 0] = 0---------- (7)

Then ATT defined unbiased situation equation stated the same to above equation (5);

ATT=E (Yi – Yo ⎪D=1) =E (Yi ⎪D - 1) – E (Yo | D=1)

Under two key conditions, PSM method was applied to estimate ATT and to make it free from bias. That conditional independence and common support assumption, is employed. Three matching algorithm was employed to check matching quality whether the matching procedure can balance the distribution of different variables or not. Those Nearest Neighbor Matching (NNM), Caliper Matching and Kernel Matching. For this study four matching quality indicators are employed those, standardized bias, T-test, joint significance and Pseudo-R^2. Finally, sensitivity of impact result were employed to check whether the impact is from cooperative service or from other source.

The dependent variable of the study used in the logit analysis is a dichotomous/binary/ variable. To evaluate the average treatment effects on treated, the study used a set of outcome variables those household incomes (HHI), household Asset (HHA), household saving (HHS), household consumption expenditure (HHCExp) and human capital (HC) that include improvement in education and medical care. Before proceeding different test to estimate researcher first check existence of multicollinearity among explanatory variables by Variance inflation factor (VIF) and Contingency coefficient (Gujarati, 2004). Variance inflation factor (VIF defined as

VIF = $\frac{1}{1+Ri^2}$ _____(8)

Where R_i^2 is the squared multiple correlation coefficient between X_i and other explanatory variables. For contingency coefficient test by using following formula.

C = $\sqrt{\frac{x^2}{n+x^2}}$ _____ (9)

Where C is contingency coefficient, x^2 is the chi-square value and n=total sample size. For dummy variables, if the value of contingency coefficient is greater than 0.75, it is an indication of existence of the multicollinearity problem among those dummy explanatory variables.

4. RESULTS AND DISCUSSION

4.1. Economic Contribution of Agricultural Cooperative

Inferential analysis result show that cooperative members have better opportunity in in receipt of job, in improving their house, having better house types (iron and non-iron) and on house asset improvements that at significance level of (1%, 5% and 5% respectively) and X^2- value 14.3, 11.5 and 4.5 respectively. Also food consumption profile and medical care of cooperative members indicate there is enhanced status rather than non-cooperative members. This implies that cooperative have statistically significant contribution food consumption and medical care at significance level 5% and 1% and X^2- value 26.4 and 10.7 respectively. Generally, inferential result show that cooperative have positive and statistically significant impact on its service user (members).

4.2 Econometric Estimation Results

Propensity Score Matching Model Result

Propensity score matching (PSM) was applied to deal with the main objectives (evaluating the impact of agricultural multi-purpose cooperative on poverty reduction indicators at rural households) of study.

Estimation Result of Propensity Scores

The logistic regression model specified in equation (2 or 5) was employed to estimate propensity scores for matching treated households with non-treated households. The explanatory variables used are variables that explain participation characteristics of the farm households and it employed for matching members house hold

with non-members.

Both variance inflation factors (VIF) and contingence coefficient result prevail that there is no strong multicollinearity among variables. Also logistic regression result show that pseudo-R^2 value of estimated model Stata result is 0.4399 which slightly less than 0.5. Therefore, treated rural households have no diverse characteristics overall and obtaining a good match among treated and non-treated household become easier.

Matching Program and Non-Program Households

There four important tasks carried out before conducting the matching work itself. First, estimating the predicted values of program participation (propensity score) for all the sample households. Second, imposing a common support condition on the propensity score distributions of household with and without the program.

That estimated propensity scores for total observation vary between 0.000556 and 0.99994 (0.442). For members vary between 0.044 and 0.99994 (mean= 0.723) and between 0.00056 and 0.952 (mean = 0.245) for non-member of cooperative. The common support region therefore, lie between 0.044 and 0.952 which means households whose estimated propensity scores are less than 0.044 and larger than 0.952 are not considered for the matching purpose. As a result of this restriction, 13 households were discarded from observations. Third, dumping observations whose predicted covariate fall outside the range of the common support region in this case only 13 households were discarded from observations. Lastly, sensitivity analysis was conducted to check the robustness of the estimation (whether the hidden bias affects the estimated average treatment on treated or not).

Choice of Matching Algorithm

The decision on the final to choice fitting matching estimator for the data was conducted based on three different criteria. First, equal mean test (balancing test) which suggests that a matching estimator which balances all explanatory variables) after matching is preferred. Second, pseudo-R^2 value with low value where preferred since it show small significance on covariate between treated and untreated household. Third, a matching estimator that ATT results with largest number of matched sample size is preferred in this case all selected three matching estimators have equal matching sample size.

However, different in balancing test and pseudo-R^2 result that calliper on radius 0.1, 0.25 and at 0.5 balancing test is seven minimum pseudo-R^2 value indicate 0.097 it is not good result compare to others. Kernel matching with band width 0.1, 0.25 and 0.5 matching sample was the same to others algorithms, but pseudo-R^2 result indicate minimum 0.053, maximum is 0.079 and 11 balancing test. Nearest neighbour matching (NN) of neighbourhood (1-5) has balancing test have11 and pseudo-R^2 value best because fail in interval 0.048 and 0.100. Therefore, nearest neighbour matching estimator with neighbourhood 4 best for this data. Hence, the estimation results and discussion for this study are the direct outcomes of the nearest neighbour matching algorithm with neighbour four. Once the best performing matching algorithm is chosen, the next task is to check the balancing of propensity score and covariate using different procedures by applying the selected matching algorithm(NN (4) matching in own case). Standardized difference in covariates before matching is in the range of 0.00% and 95.8% in absolute value whereas the remaining standardized difference of covariates for almost all covariates lies between 1.00% and 27.4% after matching. This is fairly below the critical level of 20% suggested by Rosenbaum and Rubin (1985). Therefore, the process of matching creates a high degree of covariate balance between the treatment and control samples that are ready to use in the estimation procedure.

After matching the value pseudo-R^2 is very low and there is insignificant likelihood ratio tests support that both groups have the same distribution in the covariates. Indicate that the matching procedure is able to balance the characteristics in the treated and the matched untreated groups. Hence, these results can be used to assess the impact of cooperative among groups of households having similar observed characteristics. This enables researcher to compare observed outcomes for treatments with those of an untreated groups sharing a common support.

4.3. Average Treatment Effect on the Treated (ATT)

Impact of Cooperative on Household Income

Cooperative create income generating opportunities by encourage surplus production since it provide fertilizer on time and in credit. Also increase their income by collecting crop product from their members at high price and distribute dividend. As revealed below at Table 1, that cooperative have positive and significant impact on household income from crop sells at 5% significance level and also that an average treat effect on treated indicate 2203.03 ETB difference. This result were supported by Getnet and Annulo (2012) in Sidamo zone and Salamatue (2007) in kaduna local government at Nigeria results. But it have no significant impact household income from livestock (include both livestock sells income and livestock product sells).

Table 1. Impact of cooperative service use in rural household income (ATT)

Categories	Outcome	Treated	Untreated	ATT	S.E	T-value
Household income	Crop sells	5132.25	2929.23	2203.03	496.25	4.27**
	Livestock sells	3046.77	2327.05	719.71	584.06	1.28

Source: own survey data, 2016

Impact of Cooperative on Household Asset Accumulation

Major household assets considered in this study include plant assets (perennial crop and stored crop), house durable asset and livestock (ox, milk cow, sheep, goat, horse, mule, asses and hen) valued in TLU. As shown in table 2 below, cooperative have insignificant impact in plant assets and livestock (TLU) assets on their service user household. However, cooperative have significant impact on their members in case of durable access accumulation that positive and significant at 10% of significance level and average treat effect treated (ATT) result show 491 in ETB difference.

Table 2: Impact of cooperative on rural household asset accumulation (ATT)

Categories	**Outcome variable**	**Mean**		**ATT**	**S.E**	**T-Value**
		Treated	Untreated			
Assets accumulation	Plant value	19740.32	18451.61	12881.70	3627	0.36
	Livestock /TLU/	6.81	5.536	1.18	0.802	1.47
	Durable house assets	1061.29	569.87	491.41	200.37	2.46*

Source: own survey data, 2016

Impact of Cooperative on Rural Household Saving

Result shown in table 3 below, average treated effect on treated indicate that cooperative has positive impact on saving for rural household at 1% significance level. Average treated effect on treated of cooperative participants (ATT) was 192.67 ETB at t-value 6.22. Such improvement in the level of household saving is expected to reduce financial constraint faced in their efforts to adopt modern agricultural technologies to improve their products.

Table 3: Impact of cooperative on rural household saving (ATT)

Impact outcome	indicator	Mean		ATT	S.E	T-Value
		Treated	Untreated			
Saving		256.84	65.31	191.52	30.99	6.18***

Source: own survey data, 2016

Impact of Cooperative on Household Consumption Expenditure

As revealed below in table 4, ATT estimation result and supportive evidence show that cooperative have significance impact on consumption expenditure on its member (service user). Positive value of average treatment effect on treated was 2689.33 ETB and significance indicate that at 10% probability level show food expenditure difference among both group. This result articulate that cooperative service brought on their members measureable improvement in living status and make difference among participants and non-participants.

Table 4: Impact of cooperative on rural household consumption expenditure (ATT)

Impact outcome	indicator	Mean		ATT	S.E	T-Value
		Treated	Untreated			
Household total food expenditure		11593.45	8904.12	2689.33	1373	1.96*

Source: own survey data, 2016

Impact of Cooperative on Human Capital on Rural Households.

In case of human capital (education and medical access) as shown below in table 5, contribution of cooperative in participant rural household in both education and medical care have positive contribution. However, the impact is statistically insignificant on members. Own result does not conforms results that obtain by ILO (2012) in Kenya, Tanzania and Uganda. This might be education mainly in rural area of Ethiopia have the same expense for all students since government cover those school education expense.

Table 5: impact of cooperative on education and health facility

Outcome	Mean		ATT	S.E	T-Value
	Treated	Untreated			
Education expense	2058.06	1605.04	453.02	316.32	1.43
Health expense	595.806	480.605	115.201	82.209	1.40

Source: own survey data, 2016

Sensitivity test for estimated average treatment effect on treated (ATT)

Sensitivity analysis were carried out to check quality of comparison matching among treated and untreated group with observed covariates and mainly to check robustness of unobserved covariates. Sensitivity result indicates that ATT estimate are insensitive for all significant impact indicator outcomes. That all outcome variable the ATT result show insignificant for hidden bias. Since gamma result indicate ATT result insignificant at 2.25 gamma (δ) on average. Thus, estimated ATT is robust to specific failure of CIA.

5. CONCLUSIONS AND RECOMMENDATION

To analyze impact of agricultural cooperative require data from the same households at the same time with and

without participation in cooperative is practically impossible to obtain simultaneously due to a missing counter-factual data problem. Therefore, to reduce this problem investigator apply propensity score match (PSM) for the purpose of reduced biased in estimate. Average treatment effect on treated result show that Licha farmers' agricultural cooperative had brought significant positive impact on the participants on durable home asset in case of asset accumulation and respect to house hold income, on saving had significant positive impact on their participants. Licha farmers' cooperative also had positive and statistically significant impact on rural house hold food consumption on their members. This implies significant contribution of agricultural cooperative on participant rural household in food diets rather than non-participants. Generally, Licha Hadiya farmers' cooperative union have positive and significant contribution on income from crop sells, house durable asset, saving and food expenditure (food diet) for the participant households.

This indicates that Licha farmers' agricultural cooperative have uplifting capacity to reduce rural household all dimension of deprivation (poverty). Both inferential statistics and econometric estimation result show that Licha farmers' agricultural cooperative have significant impact on rural households. Licha farmers' agricultural cooperative contribution in improving the living standard of the rural household when to compare cooperative participant with non-participant household in study area. Income and saving was high for agricultural cooperative participants compare to non-participants. Poverty profiles also indicates that participant households were less poor than non-participant households. Access to cooperative participation through promotion and good extension must be ensured to increase income and saving, hence to reduce and alleviate poverty. Licha farmers' cooperative have significantly improve participant rural household in food consumption condition, accessing job opportunity, capacity to improve their house, in building home durable asset and in meal per week. Specifically this indicate that agricultural cooperative have significant contribution in living standard of members. Therefore, strengthening and expanding the existing agricultural cooperative for rural households in zone and region would be appropriate economic policy. Licha farmers' agricultural cooperative have no statistically significant contribution on participant rural households at asset accumulation for instance plant and livestock (TLU) asset. Similarly, have no significant impact for service user household on human capital such as education and medical access. Thus, program planner and implementers at high and low level should design and implement additional service in order to support cooperative. Also union manager and boards should strengthen and expanding existing service for rural house hold in woreda and in zone would be appropriate economic policy. Finally, in order to reduce rural household bottlenecked poverty problem through improving livelihood providing sufficient agricultural cooperative service for all households. In view of such evidences, further promotion, deepening, strengthen and supporting of agricultural cooperative and its service recommended.

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