Original Research Article

THE EFFECTS OF REVOLVING FUNDS ON MILK YIELDS IN KENYA

Abstract

The study primarily aimed at determining the effects of revolving funds on milk yields among smallholder dairy farmer groups in Bomet County, Kenya. A cross-sectional quantitative data from 288 sampled dairy farmers, both the adopters and non-adopters of revolving funds was used. Propensity score matching technique was employed and the study results demonstrated that adopters of revolving funds had no significance difference with the non-adopters. This contradicts with the theory of credit access and the possible explanation could be the diversion of these funds to other non-farm sectors. Hence it is recommended that factors inhibiting maximum absorption of farm credit in the farm sectors should be considered by the policy analysts. Specifically, a policy debate of whether to give cash or farm input should be reinforced to ensure that monies set for input purchases are directed to the intended sectors.

Key Words: Revolving funds; Propensity score matching; Treatment; Milk yields

1.0 Introduction

Agricultural credit is acknowledged as the major input that accelerates the growth of the agricultural sector (Gershon *et al.,* 2020). There has been a reduction the GDP contribution of agriculture in Kenya associated with lack of access to agricultural credit (Nyoro, 2019). Farmers are faced with challenges of accessing credit, and this impede effective technology adoption. Further, being a vital resource in the agricultural sector, credit facilitates improved production and also contributes to consumption smoothing (Saqib *et al.,* 2018).

Majority of the small scale dairy farmers are characterized by subsistence production where they have limited surplus for marketing. There are however unexploited opportunities in the milk supply chain that are yet to be tapped by these farmers. To achieve commercialization of dairy farming, farmers need to have access to credit through collective actions (Cheruiyot, 2016). An outstanding concern has developed with respect to organizing small scale milk farmers to groups like cooperatives to facilitate access to credit. These dairy farmers are expected to gain economically from their dairy ventures to embrace commercial farming. However, they are inhibited by certain restrictions amid their productive capacities while accessing credit (Kiplimo *et al.,* 2015).

Agribusiness innovations in Kenya are emerging albeit marred by various challenges. A study by Okirigiti and Raffey (2015) on entrepreneurship challenges in Kenya found that one of the major challenges towards innovations is the start-up capital. Like any other enterprises, farmers in the dairy sector find challenges in accessing capital to venture into production and value addition of milk products and therefore, they engage in taking loan to finance such ventures. Mwangi and Ouma (2012) notes that an individual can access loan from a commercial bank in Kenya by providing a proof of collateral and a six month record showing personal earnings from the job attended.

Accessing loans from formal financial institutions by small holder farmers in Kenya has derailed agricultural commercialization. This has led to emergence of revolving funds where farmers borrow without the element of having to secure collaterals. The Revolving Funds form part of the County Enterprise Fund which was established in 2015 to support farmer groups through multipurpose cooperatives located in each of the wards in the county (BCIDP 2018-2022). This category of funds is targeted to finance different enterprises including dairy farming. The funds are administered to groups of farmers because of their inability to raise enough funds to loan them to their members. Members form groups and raise funds by mobilizing their own savings through shares and this build a pool of funds through which members can borrow from.

Despite having a fast-growing dairy industry compared to other developing countries, Kenya is still a net importer of dairy products (Behnke & Muthami, 2011). The problems of the dairy industry are becoming even more serious as population increases, growing demand elasticity due to changes in consumers' tastes and preferences and rise in income (Blackmore *et al*., 2020). This calls for an urgent and long-term measure to increase productivity. Moreover, Kenya's commercial dairy production largely takes place in the highlands with favorable agro-climate, infrastructure and market access.

Theoretically, there exist a connection between farming outputs and agricultural credit. However, farmers dwelling within rural set ups are poor because they rely mainly on agriculture as their source of livelihoods and are characterized by low agricultural outputs , lack of access to assets and prone to frequent agricultural risks (Gershon *et al.,* 2020). Affordable credit access by dairy farmers has the potential to transform subsistence dairy farming into a commercial oriented agribusiness venture.

1.2 Methodology

The study was conducted in Chepalungu; one of the five sub-counties in Bomet county, Kenya. Purposive sampling method was applied in sampling out smallholder dairy farmers. The respondents were administered with questionnaires and personal interviews for primary data collection. These comprised two groups of dairy farmers in the area of study representing 144 users and an equivalent number of non-users of financial credit services offered by the county government. This study employed propensity score matching (PSM) method being a suitable tool in appraising the outcomes of credit (revolving funds) administered to dairy farmers in comparison to non- participants of the funds that acted as a control group.

Specifically, PSM was employed to ascertain an equivalent group of dairy farmers representing non-users of revolving funds but had an equal chance of receiving the funds like the beneficiaries. Ideally, participants from the treated and the control group are similar only that they differ in participation in Revolving Funds. Therefore, the model involves two stages where the likelihood of participation is evaluated in the first stage by determining the propensity scores of each individual participation.

The probability model of participation is therefore represented as:

$P(Y) = Pr\{T = 1\backslash Y\} = E\{T\backslash Y\}$

Where, $T = \{0, 1\}$ which takes a binary form of a value expressing farmers' participation in revolving funds (1) and 0 otherwise.

Y =multivariate vector of individual characteristics

Finally, Average treatment effect for the treated (ATT) is then calculated where households who participated in revolving funds are matched with those that did not received the funding but with identical propensity scores. Literature depicts that Propensity score is a tentative chance that a household is subjected to a treatment subject to observable predictor variables

(Rosenbaum and Rubin, 1983). The effect of treatment is reflected in the possible outcome (milk yields) between the participants and the non-participants.

1.3 Results and Discussions

Table1: Distribution of Revolving Funds by Participants

Did you Participate in Revolving funds?	Freq.	Percent	Cum.
Non-Beneficiary	144	50	50
Beneficiary	144	50	100
Total	288	100	

1.3.1 Estimation of the propensity scores

Propensity scores are estimated by use of a binary discrete selection regression framework (either logit or probit) can be used. From table 2, the chi-square test statistic displayed a statistical significance at 1% significance level, indicating that there was no explanatory power of the model hypothesis that was rejected. The low pseudo-R2 (0.239), indicates the absence of methodical divergence reflected by the covariate distribution between beneficiaries of revolving funds and the non-beneficiaries from the study area. A small pseudo R2 value reveals that there was little or no distinct difference between the two groups of dairy farmers thus getting a right match between them. The number of observations from the sampled dairy farmers was 144 respondents with a *Chi*-square test of 31.67 and the

degrees of freedom of 8. Subsequently, being less than zero implied that some of the variables' co-efficient were not equivalent to zero.

Propensity scores were estimated by the use of a probit model where the intervening variable (participation in revolving funds) was regressed against household age, gender, head, farmer's level of education, family size, farming experience, household off-farm income, herd size, farm size, credit use and access to extension services. The regression outcomes shown in table 2 demonstrates that family size, herd size, farm size and visits to agricultural extension services received by a dairy farmer influenced their choice of participation in revolving funds.

Table 2: Probit Regression for Calculating the Propensity Scores

					Number of obs = 144	
					LR chi2(8) = 31.67	
					Prob > chi2 = 0.0001	
					Pseudo R2 = 0.2389	

TREATMENT	Coef.	Std. Err.	z	P>z	[95% Conf.	Interval]
Gender	0.2165	0.3187	0.6800	0.4970	-0.4083	0.8412
Age	-0.0045	0.0156	-0.2900	0.7710	-0.0351	0.0261
Education Level	-0.0193	0.0453	-0.4300	0.6710	-0.1081	0.0696
Family Size	0.1797	0.0703	2.5600	0.0110**	0.0420	0.3174
Farming experience	0.0053	0.0177	0.3000	0.7640	-0.0294	0.0400
Household off farm income	0.0000	0.0000	-0.9000	0.3690	-0.0001	0.0000
Herd size	0.1658	0.6788	2.4400	0.0150**	0.3273	0.2988
Farm size in acres	-0.2074	0.1236	-1.6800	0.0930*	-0.4496	0.0348
Agricultural Extension visits	0.5716	0.1431	3.9900	0.0000** *	0.2910	0.8521
_cons	-1.7556	0.8350	-2.1000	0.0360	-3.3921	-0.1190

Asterisks ***, **, * constitutes significance levels representing 1%, 5% and 10 % respectively.

A unit increases in family size increases the probability of participation in revolving funds by about 18%. The number of children in the household reflects availability of labor for livestock activities. Family size has been reported as the most important determinant of the labor investment in the smallholder dairy farms (Fita *et al*., 2012). Further, increase in the size of the household contributes to rising demand for credit since a large family would imply increase in household necessities. Hence, the need for more funds to supply such needs intensifies as reported by (Ijioma and Osondu, 2015).

The number of livestock owned by the sampled households had a positive, significant impact for participating in revolving funds. Livestock has a number of social and economic functions, and an increase in the number of livestock indicates respect, which might help secure the credit with ease. Apparently, a larger herd size seemingly encourages the need for more funds to gather for the livestock rearing. This involves meeting expenses like deworming, disease controls, and acquisition of AI services and purchase of animal feeds. Immediate cash at hand at the disposal of the farmer is therefore required and this explains why a positive relationship existed. Awotide *et al.* (2015) revealed that farmers owning large herds of cattle are likely to borrow more credit than those with small herds.

In the same vein, an increase in farm size was found to have a negative and significant coefficient indicating that it decreases participation in revolving funds by 20%. Increase in farm size might show the economic status of the farmer, which probably decreases the need for credit. Chandio *et al*. (2017) confirmed size of the farm as a significant element in getting formal and informal credit and that it symbolizes higher social rank in the society.

Agricultural extension visits was found to positively and significantly influence participation in revolving funds. An increase in extension visits increased participation in the funds by 57%. During extension visits, farmers are empowered through information access and knowledge regarding different techniques of dairy production. These farmers therefore develop the need for financial credit services to upgrade or adopt new farming technologies as confirmed by (Kiplimo *et al.,* 2015) and (Cherotich *et al.,* 2021). Agricultural extension officers are also believed to demonstrate a crucial part in disseminating agricultural knowledge as well as financial information (Gido *et al.,* 2015).

Table 3: Propensity scores Estimates at the Region of Common Support

	Percentiles	**Lowest**
1%	0.0035	0.0010
5%	0.0174	0.0035
10%	0.0269	0.0037
25%	0.0502	0.0111
50%	0.0984	
		Highest
75%	0.1759	0.7126
90%	0.4604	0.7710
95%	0.5412	0.8391
99%	0.8391	0.9528
Observations		152
Sum of Weights.		152

Mean	0.1585
Std. Dev.	0.1810
Variance	0.0328
Skewness	2.1449
Kurtosis	7.4685

The second step of PSM estimation involves balancing propensity scores of the adopters and the non-adopter groups. Common support conditions for the sampled farmers are then defined where, a minima and maxima comparison was made. The propensity scores estimated, as shown in table 2, varies between 0.0010 and 0.9528 with a mean of 0.0984 for both adopters and non-adopters. This would therefore mean that common support region would lie between 0.0010 and 0.9528. Based on these restrictions, five blocks were identified with 34 households (15 beneficiaries and 19 non-beneficiaries) being dropped from the analysis when estimating the average effect of accessing credit on milk yield as indicated by table 4 below. The estimated units of blocks controls the mean values of propensity scores for the two groups of farmers is represented as shown.

Table 4. Estimated units of blocks

Inferior of block of Pscore	Did you participate in revolving funds?		
	Non-Beneficiaries	Beneficiaries	Total
0	125	129	254
0.2	14	3	17
0.4	4	6	10
0.6	0	5	5
0.8	1	1	2
Total	144	144	288

A graphical presentation of the matching is presented in figure 1 below which shows estimates of propensity scores representing beneficiaries and non-beneficiaries of revolving funds. Figure 1 depicts similar propensity scores distribution hence easy comparison amongst the adopters and the non-adopter groups.
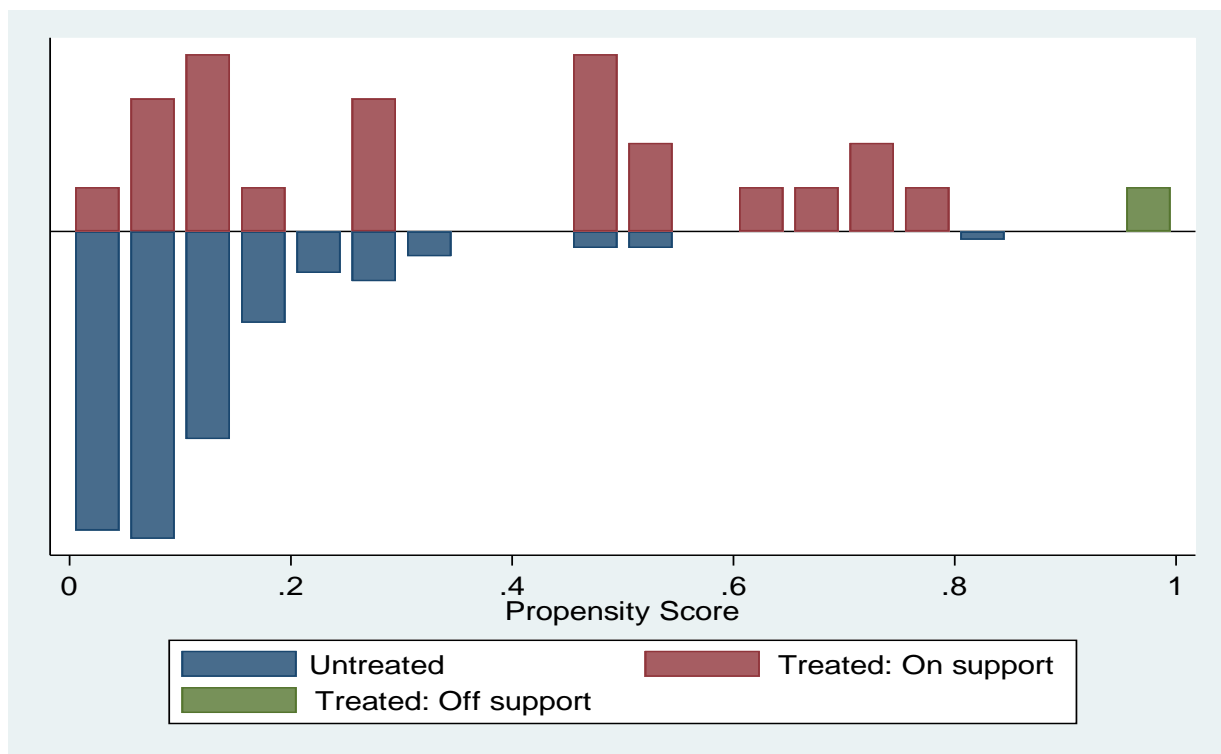
Figure 1: Propensity scores distribution

The last step in the PSM was to estimate treatment effects on the outcome variable in the matched sample through a t-test statistics. After accounting for the pre-participation differences, it was found that, on average, participating in revolving funds has decreased milk yields by 0.196 liters as indicated in table 3. This means that revolving funds has decreased the milk yield of participating households by 3.64%. Information gathered from the focused group discussions also confirmed that participants didn't enjoy considerable benefits in terms of increased milk yield since they started engaging in revolving funds. However, most of the participants declared that revolving funds received through groups relied majorly on the amount of savings in the group. Therefore, participants received varying amounts of the loan which were later diverted to meet urgent needs such as payment of school fees, meeting consumption and social needs. Additionally, dairy farmers earn income from milk sales on monthly basis and most households admitted that revolving funds cushioned them during that period until they received their proceeds from milk sales. Moreover some of the participants

disclosed that the restricted nature the loan received (small amounts), made it inadequate to meet dairy needs after spending part of it on household necessities. This findings agrees with the studies by Seyednoorani *et al.,* (2019).

Table 4: Effects of Revolving Funds on Milk Yields

Variable	Sample	Treated	Controls	Difference	S.E.	T-stat
Milk Yields	Unmatched	5.125	4.836	0.289	0.607	0.48
	ATT	5.174	5.37	-0.196	1.182	0.17

After matching, the t-statistics analysis showed that based on the observable characteristics, the results displayed that the difference between beneficiaries and the non-beneficiaries of revolving funds was not significant. Thus showing that the adopters never benefited from adoption. Whether adopters really benefited from adoption is an empirical question that this study recommends.

1.4 Conclusions and Recommendations

As revealed in the study, credit access to farmers is an issue and the few who get the credit either diverts the funds to other sectors or have inefficiencies in absorbing these funds into the dairy sector. Literature widely suggests that the future of Kenyan economy relies mainly on agriculture; being a significant sector which provides employment and source of income to the rural inhabitants. Therefore, there is a need for affective credit policies that empowers all the participants in the agricultural value chain. Specifically, stakeholders should consider

giving credit to farmers in form of farm inputs to ensure that credit allocated for input purchases are directed to the intended sectors. Finally there is need for the government of Kenya to increase the amount of funds allocated to counties and this will ensure that higher amounts of funds are reimbursed to groups thus enabling them to make substantial investments into their dairy ventures.

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