

Full Length Research Paper

An evaluation of the effects of revolving funds on dairy inputs' use in Chepalungu Sub-County, Kenya

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The major challenge facing agricultural investments in Kenya is not the adoption of emerging technologies but the empirical question is whether the adopters really benefit from adoption. While extant literature has been focusing on whether farmers adopt to presented technologies, the novelty of this study is to present whether the adopters really benefit from adoption. The objective of the study was to evaluate the effects of revolving funds on the investment of agricultural inputs. A double hurdle model was applied to determine participation decision and the extent of how the adopters utilized revolving funds. Farmer's decision on adoption and the ratio of revolving funds dedicated to dairy inputs were made at two separate stages. Results showed that the type of dairy enterprise and farming experience significantly affected the adoption decisions. Group membership and household income levels in the second tier were found to be significant hurdles towards the usage of revolving funds. The policy implication is that for farmers to increase the intensity of the use of revolving funds in their dairy enterprises, two major hurdles must be surpassed; investment in cooperative movements as well as improving the farm and non-farm incomes of the dairy farmers.

Key words: Revolving funds, double hurdle, agricultural inputs.

INTRODUCTION

Smallholder farmers are the center of the agricultural transformation in Kenya as they play a critical role in GDP contribution, employment creation and the general food security of the country. Their role in the agricultural supply chain remains underutilized based on the limitation in the available resources at their disposal (Omulo and Kumeh, 2020). It therefore becomes difficult for their transition from subsistence to a commercial agriculture. The focus on smallholder farmers is based on

the fact that smallholders have scarcity of resources as well as inefficient technologies that limit their transformation into commercial farming (Hakizimana et al., 2017).

Whether the investment in smallholder farmers is supported or questioned, the fact that these farmers face several challenges is acknowledged by both sides. Actually, they are these challenges which reinforce the pessimistic views of focusing on the transformation of

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Table 1. Proportionate clustering.

Ward	Proportionate to size sample for beneficiaries	Proportionate to size sample for non-beneficiaries
Kong'asis	$144 / 1384 \times 308 \approx 32$	32
Siongiroi	$144 / 1384 \times 346 \approx 36$	36
Chebunyo	$144 / 1384 \times 327 \approx 34$	34
Nyangores	$144 / 1384 \times 211 \approx 22$	22
Sigor	$144 / 1384 \times 192 \approx 20$	20
Total sample	144	144

agriculture among smallholder farmers. The point is that agriculture-based growth necessitates the pumping of capital which is a challenge to many farmers due to low income and the lack of collaterals to secure loans (Musembi, 2019). The perishability nature of agricultural products makes securing loans to finance agriculture a nightmare by many small-scale farmers.

Access to credit in Kenya has been identified as an inhibiting factor towards agricultural commercialization. High interest rates from banks and other financial lenders have made access to capital a challenge especially when focusing on the perishability of agricultural products (Ng'etich, 2019). While revolving funds may be available among different farmer groups, the rate of credit access by many farmers in the country is still low.

Whether real or perceived, new technologies among small holder farmers are slow to disseminate (Mungai and Sma, 2019). Revolving Funds (loans) have been implemented by various countries in trying to address their effectiveness, accrued benefits and improving livelihoods. The adoption of these loans and their intensity of usage among farmers has scanty documentation especially in Kenya. However, literature concurrently reveals that adoption is a successive development as opposed to a simultaneous event.

The first step is assumed that a farmer chooses to deliberate on particular attributes about technology. Subsequently, the second step which is the outcome is manifested in the intensity of adoption (Khatri-Chhetri et al., 2017). The main assumption is that a smallholder farmer will choose and adopt new technologies that he/she perceives that has minimum risk. Further, smallholder socioeconomic characteristics such as the farmer's experience are perceived to determine technology adoption over and above the extent of participation level (Ali et al., 2018).

MATERIALS AND METHODS

A cross-sectional study was done in Chepalungu, Bomet County in Kenya, where data employed was gathered between September and November, 2019. The study used probability sampling

technique to select Chepalungu sub-county due to its wide coverage with the main economic activity being dairy production. It has five wards which include: Kong'asis, Siongiroi, Sigor, Chebunyo and Nyangores. Smallholder dairy farmers were sampled using purposive sampling technique from all the five wards. The sample size required was determined using the following formula by Kothari (2004).

$$n = Z^2 pq / e^2 \quad (1)$$

where n is the required sample size, Z is the confidence level = 1.96 at 0.05 level of significance, p is the proportion of the population represented, q is the proportion of the population not represented, $q = 1 - p$ and $e = 0.05$, is the acceptable margin of error for the proportion estimated. Hence,

$$n = (1.96)^2 0.75 (0.25) / (0.05)^2 = 288.$$

There were 1,384 members that had benefited from the Revolving Funds according to the list of beneficiaries in Chepalungu sub-county office (CFSP, 2018). Out of this list, 308 were from Kong'asis, 346 (Siongiroi), 327 (Chebunyo), 211 (Nyangores) and 192 from Sigor. The required sample per ward was then determined using proportionate to size sampling method by Kothari (2004).

$$n_i = n / N \times P_{total} \quad (2)$$

where, n_i = Desired sample size per ward, n = Desired sample size for the study, N = Total number of the target population in the sub-county, and P_{total} = population per ward. The results are presented in Table 1.

Equal number of respondents from the non-beneficiary group was chosen. This comprised 144 beneficiaries and 144 non-beneficiaries of Revolving Funds. Semi-structured questionnaires and interview schedules were used to collect primary data. The questions were administered to dairy farmers who were beneficiaries and non-beneficiaries of revolving funds in Chepalungu sub-county to yield a sample size of 288 dairy farmers.

A double-hurdle model was applied to determine household's decision to take part in revolving funds and the intensity of revolving funds in acquisition of dairy inputs. The Double-Hurdle (DH) or two-tiered model was proposed in 1971 by Cragg and it allows for the possibility of having different set of factors influencing farm input participation and its level (Ingabire, 2019). With DH model, a farmer is assumed to pass into two distinct hurdles in the process of farm input participation. In the first hurdle, a probit regression is estimated to determine the factors affecting credit participation (decision to have revolving funds). In the second tier, a truncated normal regression model (Tobit) is used over the non-zero values of the sampled observations (those who acquired the revolving funds),

to identify the differential in the usage of the revolving funds.

The first stage of the model involves selection and it is determined using a probit model. This represents the likelihood of confined reflection.

$$d_i = 1 \text{ if } d_i^* > 0 \text{ and } 0 \text{ if } d_i^* \leq 0$$

$$d_i^* = Z_i \alpha + \varepsilon_i$$

where d_i^* = Participation determinant, z = explanatory variables speculated to determine participation, α = a vector of parameters, and ε = error term.

The last hurdle postulates the resultant effects of acquired credit. It requires the application of a truncated model to ascertain the magnitude of participation in credit (Revolving Funds) for the acquisition of inputs. Only households that recorded a positive value in the use of credit will be considered. The model is specified as:

$$w_i = w_i^* \text{ if } w_i^* > 0 \text{ and } d_i^* > 0$$

$$w_i = 0 \text{ otherwise}$$

$$w_i^* = x_i \beta + \mu_i$$

where w_i = remarkable reaction on the extent of credit use through dairy inputs, x = explanatory variables speculated to determine the extent of credit use, β = a vector of parameters, and μ = error term.

RESULTS AND DISCUSSION

Descriptive statistics

Gender

The ratio of the sampled farmers indicate that male were 46.53% while female household heads were 53.47%. Household head position is regarded as crucial in making decisions and the extent of technology adoption. Furthermore, gender also contributes a great deal of information about the conduct of the people dwelling in the area of study (Gebre et al., 2019). The basic resources such as land and livestock are owned and controlled by men and this has a central part of program planning, design and implementation of a breeding program. Therefore, the preference of the household heads was likely to affect their participation in the credit acquisition through the revolving funds (Figure 1).

Activities engaged

The largest share of the respondents indicated that they engaged in business and other income earning activities while farming took 21.9% of the reported share. Most farmers in Kenya diversify their means of earning a living in order to survive during economic recessions and to

curb poverty. This is highly practiced by the rural communities where agriculture is the main occupation (Tomich et al., 2018) (Figure 2).

Feeding routine

Almost all farmers in the study area reported an open grazing as opposed to zero grazing. Any rational farmer will adopt a farming routine that increases returns to resources that are constrained. The minimum land size threshold to indicate factor constraint was perhaps not yet reached unlike in high potential areas where the land sizes are small and ideal for zero grazing. The land size from the sampled area was not a constraint towards dairy farming and therefore there was free land that could facilitate an open grazing mechanism (Figure 3).

Regression analysis

As double hurdle model maximum likelihood estimates result show, Chi square overall = 16.50, P overall ≥ 0.0113 is significant at 5% level. This indicates that both stages taken together significantly explain the data and the joint significance of the explanatory variables that were used. The results of the first tier depicted that the years of farming experience and the type of dairy enterprise, significantly influenced decision to participate in revolving funds at 10 and 1%, respectively as indicated in Table 1.

Experience in dairy farming influences ($P \geq 0.079$) the decision to participate in revolving funds by 14.2%. An increase in experience of the dairy farmers by one year increased the probability of engaging in revolving funds as indicated in Table 2. This means that farmers with more experience in dairy farming have a higher probability of engaging in revolving than those with less experience because, they have more knowledge and skills. Our findings are supported by the findings of Doss (2018) who found out that an increase in farmers experience by one year, increased probability of increasing the output of a given farm enterprise. This is attributed by the fact that more skills and knowledge are acquired in the process of production.

As Asante et al. (2018) observed education level of the farmer and practical/real experience with the breeds are important in cattle breed choice. Farmers experience in dairy cattle keeping may be associated with his ability to cope with risks, such as endemic diseases. Experienced farmers are better in controlling the risks in dairy by diagnosing and controlling diseases, and by giving the right kind of feeds (Mekuria and Mekonnen, 2018).

Farmers' engagement in dairy enterprise commercialization was found to negatively affect the level of participation in revolving funds. This indicates that as farmers increase their level of commercialization, they

Gender

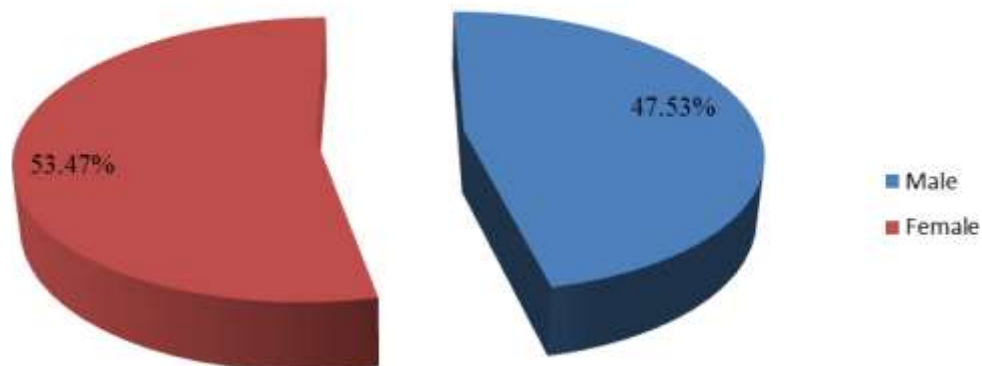


Figure 1. Sampled farmers by gender.

Livelihood activities

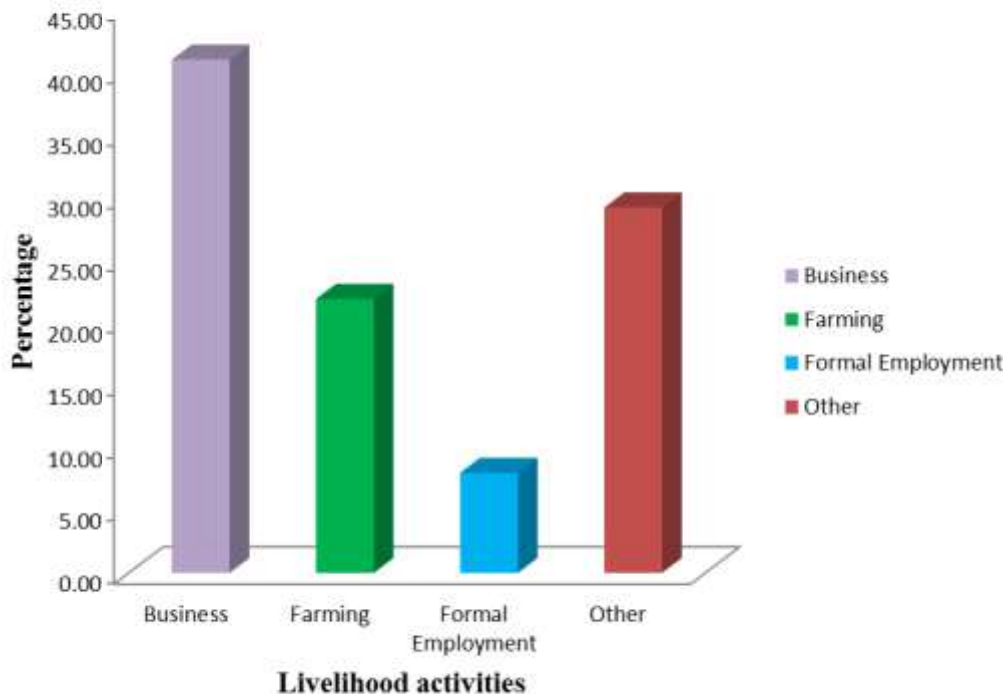


Figure 2. Sampled farmers by their livelihood activities.

reduce their level of involvement in revolving funds. This phenomenon could be attributed by the fact that as the level of commercialization and specialization increases, farm income increases hence cautioning the farmers

when in need of income. It therefore indicates that, as the level of commercialization index increases, the need for revolving funds declines perhaps as the farmers shift to commercial banks where they are now eligible for large

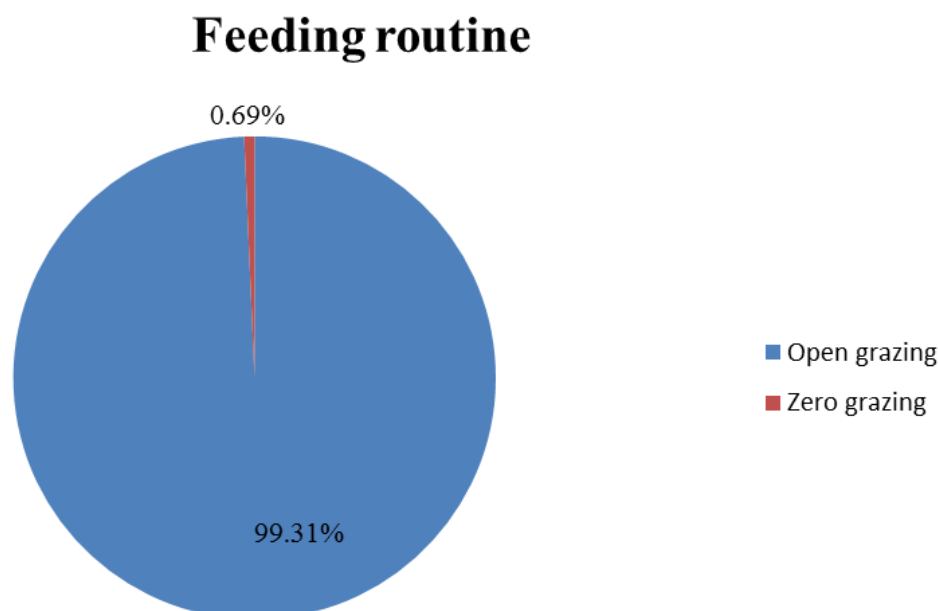


Figure 3. Pie chart representing dairy farming feeding routine.

Table 2. Double hurdle results.

Variable	Coefficient	Std.Err	z	p>[z]	{95% Conf. Interval}
Gender	0.1207	0.2030	0.59	0.552	-0.2772 0.5188
Householdsize	-2.4560	0.3029	-0.81	0.417	-0.8392 0.3480
Farming experience	0.1420	0.0809	1.76	0.079	-0.0164 0.3006
Tier1 Group membership	0.1012	0.4642	0.22	0.827	-0.8085 1.0111
Dairy enterprise	-0.6608	0.2435	-2.71	0.007	-1.1381 -0.1834
Education level	-0.0306	0.0347	-0.88	0.379	-0.09888 0.3756
_cons	2.1380	1.1014	1.94	0.052	-0.0206 4.2968
Tier2 Education level	-0.0584	0.0584	-1.06	0.288	-0.1661 0.0492
Group membership	0.9934	0.3359	2.96	0.003	0.3350 1.6517
Employment status	-1.0000	0.2028	-4.93	0.000	-1.3976 -0.6025
_cons	2.9744	0.5194	5.73	0.000	1.9563 3.9924
Sigma _cons	1.6931	0.1288	13.14	0.000	1.4406 1.9456

Log likelihood = -503.07865, Number of obs = 288, Wald $\chi^2(6) = 16.50$, Prb > $\chi^2 = 0.0113$.

amounts of commercial loans.

Group membership did not influence farmers' decision to take part in revolving funds. However, it was established to determine the magnitude of credit utilization in the purchase of inputs. The observation entails that group members have the potential to increase the absorption of credit into input purchases. A possible explanation to this is that groups are formed by individuals with similar goals and/or characteristics and therefore were inclined to absorb the credit fund into the

purchase of dairy inputs. The finding on positive effect of members association on intensity is consistent with those of Ghimire et al. (2015) on adoption intensity of agricultural technology of maize smallholder farmers in Nepal (Table 3).

Group membership involves the dynamics that may results from interaction of the group members. These interaction influences the behavior of both individual group member and the group as a whole. As the results indicate in the second tier, group membership is critical in

Table 3. Marginal effects.

Variable	Delta method				
	dy/dx	Std.Err	z	p> z	95% Conf. Interval
Gender	0.1207	0.2030	0.59	0.552	-0.2772 0.5188
HHsize	-0.2456	0.3029	-0.81	0.417	-0.8392 0.3480
Farming_experienc	0.1420	0.0809	1.76	0.079	-0.0164 0.3006
Group_membership	0.1012	0.4642	0.22	0.827	-0.8085 1.0111
Dairy_enterprise	-0.6608	0.2435	-2.71	0.007	-1.1381 -0.1834
Education_level	-0.0306	0.0347	-0.88	0.379	-0.0988 0.0375
Employment_status	0	(omitted)			

Average marginal effects (Number of obs = 288). Model VCE: OIM; Expression: Linear prediction, predict (); dy/dx w.r.t.: Gender HHsize Farming_experience Group_membership Dairy_enterprise Education_level Employment_status

informing on the extent of credit utilization in purchasing dairy inputs. Groups have informal rules and norms that govern how individuals collectively achieve a specific goal. Social sanctions among members are evident in group membership hence individuals act as checks and balances across the groups.

Household income levels negatively influenced the extent to which dairy farmers utilized revolving funds in the purchase of dairy inputs. This implied that, as the dairy farmers participated more in other non-farm activities, the ratio of credit devoted to dairy inputs purchases declined as a result of credit commitment to such sectors. Hence a farmers' stable employment status leads to diversification which contributes to low absorption of credit into dairy inputs purchases as reported by Cherotich et al. (2021).

Empirical reports describe the level of education as human empowered talent; whereby enhancing it improves the power of earning a living (Salike, 2016). Results disclosed that education level did not affect participation in revolving funds and the intensity of participation. This implies that the years of schooling by the sampled households had no influence on the engagement with revolving fund. This contradicts the study by Khoza et al. (2019) who concluded that farmers who spent more time at school tend to engage more in agro-processing and value addition once they have an access to credit. A possible explanation to this scenario is that as the level of education increases, individuals tend to shift from farm to non-farm income and the search for white color jobs sets in.

CONCLUSIONS AND RECOMMENDATIONS

The study provides new insights on the adoption of technologies among small holder farmers. As the results indicate, once the hurdles have been accounted for, a change in dairy enterprise from one level to another

decreases the amount of revolving funds used in the purchase of inputs ($dy/dx=0.66$, $p \geq 0.007$). Similarly, an increase in one year of farming experience increases the likelihood of revolving fund usage in farm inputs by 14.2%. Whereas credit access has hindered agricultural commercialization, revolving funds across farmers' groups have not been widely adopted especially by the dairy farmers in Bomet County. There was a sharp discrepancy between the willingness to use credit and the actual absorption into input purchases. There is therefore need for the stakeholders to help address the challenges associated with the use of revolving funds among the dairy farmers. Stringent measures on the intensity of credit use should also be a focus as many farmers reported low absorption of the credit into dairy input purchases.

CONFLICT OF INTERESTS

The authors have not declared any conflict of interests.

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