Repayment Performance of Smallholder Farmer Revolving State-credit in Luwero District, Uganda

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Abstract Many state-sponsored agricultural credit schemes in developing countries such as Uganda collapse due to high default incidences. Using Tobit regression and descriptive statistic analysis, this study inquired into repayment performance of one state-provided credit – the Integrated Support to Farmer Groups (ISFG). Structured questionnaires were developed, pre-tested and then used to collect data from 153 beneficiaries. Respondents were sampled by purposive and then multi-stage random technique. The respondents were; male dominated, aged 45 years and with formal education level of seven years. Repayment of the ISFG significantly depended on; the distance of the beneficiary from the sub-county, the period taken by the farmed enterprises to mature, beneficiary education level and credit use experience, amount to be repaid and returns to the credit. The paper recommends promotion of short-period maturing enterprises under the ISFG, integration of adult education in the scheme and selection of beneficiaries farther away from the sub-county if the likelihood of repayment of the ISFG is to be enhanced.

Keywords: ISFG credit, repayment, tobit model

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1. Introduction

Uganda through the ISFG scheme adopted credit provision to small scale farmers under the Rural Development Strategy (RDS) because agricultural credit has a significant role in reducing poverty and enhancing food security [1]. Most of Uganda's policy documents such as the National Development Plan – NDP and Agricultural Sector Investment Plan – ASIP (2010/11-2014/15) fully recognize credit provision as an Agricultural development strategy. Since adoption of national agricultural advisory services in the 1950s, credit provision has always been undertaken as a development instrument by many governments. Credit assists farmers to break the bondage of poverty and elevate them to an advantaged position in the global market. Its provision also augments input use, accelerates technological change and is an anti-poverty strategy at least in the short term.

Even then supply of rural credit in Uganda remains poor. It is concentrated in urban areas and dominated by a few. Formal lending excludes many. Okurut *et al*., [2] reported that close to 43% of Uganda's farmers have difficulties in accessing credit. While 80% of Uganda's population derive livelihood from Agriculture, its share of total credit is low. Exacerbated by policy inconsistencies and ineffective institutional frame works, default rates remain high in agricultural credit schemes such as the

ISFG. Subsequently, several credit schemes in Uganda are characterized by dismal performance and eventual total collapse.

The ISFG credit scheme was undertaken to facilitate agrarian productivity and reduce poverty by 28% by 2014. Through the ISFG, farmers in a group receive state credit mostly in-kind. Since public institutions have limited funds to meet demand for credit [3], the budget per farmer under ISFG is small and therefore implementation of ISFG adopts a principle of revolving it within farmers. The credit is given to a section of farmers selected once every year in a Village Farmers' Forum (VFF) and the beneficiaries must pay it back to their groups such that the fund revolves to other farmers and gets recapitalized.

The Ministry of Agriculture Animal Industry and Fisheries (MAAIF) targeted that 80% of the ISFG beneficiaries would repay and replicate the fund at household level, but default still persists negating the objectives of the ISFG. Lukwago [4] also noted that farmers are not aware of pay backs. Finscope reported that 70% of people in Uganda who need credit do not access it due to default vice by the first beneficiaries. Consequently, the proportion that is revolved remains low and as such credit does not reach or benefit subsequent or all potential beneficiaries [1]. Where default plagues credit schemes like in developing countries such as Uganda [5], the critical role credit plays in agricultural development is constrained.

It is imperative to inquire into credit repayment such that issues responsible for its default are understood. Yet

Mpuga [6] analyzed demand for credit in Uganda not its repayment and Muhumuza [7] compared the role of government and private sector in credit provision not its repayment. This study asked what are the attitudes of the beneficiaries to the credit, what issues drive default and what is the likelihood that the credit will be repaid. We therefore employ a censored regression and descriptive statistical analysis to characterize the ISFG beneficiaries and assess their current perceptions towards the ISFG. We also determine and compare the level of ISFG repayment in the two categories of beneficiaries and then assess the determinants of its repayment.

2. The Beneficiary Sample

Table 1 and Table 2 illustrates the socio-demographic characteristics of the beneficiaries.

Over all, participation in the ISFG was dominated by males at 52.2% (Table 2) implying that revenues from ISFG accrue more to men than females. The beneficiaries were 45 years on average (Table 1) an indication that they are still innovative and economically active. Their level of formal education was seven years in school therefore the ISFG beneficiaries are lowly educated and may not form a better caucus for inventive productivity and increased innovation to enhance repayment. Averagely, respondents farmed 3 acres which is considered low and hence the output and the value thereof. Standard deviations associated with farmed land are high, an indication of a great variation in the acreage farmed by the respondents. Farming is the major income earner as reported by 70.5% of the sample (Table 2). Of the whole sample, 84.3% own land for production implying that the majority can access or have land over which to manage the enterprises given under the ISFG scheme. Since 69.3% of the households of the ISFG beneficiaries are headed by men (Table 2), most decisions on the ISFG including the decision to repay or default are mainly taken by men. More than half of the respondents have never borrowed credit; they have no experience in credit management. This negates repayment of the ISFG credit. The chi-square statistics in Table 2 portray no dependency between females and males as concerns gender of the ISFG beneficiary and that of the household head.

Table 1. Continuous variables

| Respondent characteristic | Means | | | t-value |
	Food security (n=111)	Market Oriented (n= 39)	Both groups (N=150)	
Age of respondents (Yrs)	46.3(13.0)	42.9(10.2)	45.4(12.5)	3.02*
Years of formal schooling	7.56(3.9)	9.2(3.9)	7.9(4.0)	4.12**
Household size	7.1(3.1)	7.9(3.3)	7.3(3.1)	1.27
Acreage under farming	3.13(3.8)	4.0(4.1)	2.3(2.2)	1.59
No. of economically active members in a household	2.3(2.4)	2.2(1.8)	2.2(2.2)	0.06

Figures in parentheses are the standard deviations, Source: Field data analysis.

Table 2. Categorical variables associated with the beneficiary sample

| Characteristic | Food security | Market oriented | Total | | χ2 statistic |
			Frequency	Percent	
Gender of beneficiary					
Male	48	29	77	51.3%	11.56***
Female	63	10	73	47.8%	
Household head's gender					
Male	70	33	103	68.7%	6.297**
Female	41	6	47	31.3%	
Major household income source					
Farming	81	24	105	70.0%	1.461
Non-farming	30	15	44	30.0%	
Beneficiary 's land ownership					
Don't own	20	4	24	16.0%	1.461
Own	91	35	126	84.0%	
Experience in borrowing					
Never borrowed before	69	18	88	58.7%	3.046
Ever borrowed before	41	21	62	41.3%	
Sources of credit					
Commercial bank	8	6	14	9.3%	6.933
Friends	2	2	4	2.7%	
NGO	0	1	1	0.7%	
SACCO	31	12	43	28.7%	

Source: Field data analysis.

3. Theoretical Considerations

ISFG beneficiaries are selected on the basis that all households in a village should participate in the scheme. The beneficiary selection guidelines uphold that all households participate in this credit scheme and wealth is equitably distributed within a village.

However, repayment of credit is influenced by characteristics of borrower and lender and the loan design itself IFPRI [8]. To enhance its repayment therefore, ISFG should not just be about all to get or a fair wealth distribution in a village, but rather beneficiaries should be selected basing on their characteristics, the loan design itself and the wishes of the borrower. Previous research on credit repayment by Otunaiya *et al*., [9] indicates that farmer characteristics such as their income and degree of diversification influence repayment. Therefore to condition repayment of the ISFG, beneficiary selection should consider such factors as those argued by Otunaiya *et al*., [9]. In addition, Briggeman *et al*., [10] explained that household characteristics such as family size, economic activeness and political frameworks also shape a farmer's decision to repay state credit. Summed up together, character, capacity and capital of the beneficiary should be considered because they influence repayment of credit.

4. Review of Econometrics and the Econometric Models Used in Repayment Analysis

Credit repayment could be analyzed by binary response models, in which the repayment likelihood Y_i measures probability of total default (0 % repayment) or full repayment and is explained by a vector of socio-economic, demographic and institutional factors in the equation below;

$$Y_i = x'\beta + \varepsilon_i, \sim \varepsilon_i F(y_i / \theta) \text{ and } \varepsilon_{ij} \sim N\left(0, \sigma^2\right). \quad (1)$$

The choice **Y** made by the beneficiary to repay or default ISFG is observable; it measures the likelihood Y_i of repayment in equation 1 above. **Y** is measured by the researcher in a binary response; where Y= 1 implies total repayment, otherwise Y = 0 total default. X' is a vector of covariates that explain repayment. β is the vector of parameters to be estimated, ε_{ij} is the stochastic component arising out measurement errors as according to Maddala [11].

However, the use of binary choice models in analyzing credit repayment although used by Wadonda [12] is inappropriate. Even discriminant analysis applied by Afolabi [13] and Walekhwa [14] requires binary responses (default or repayment) in which a beneficiary characteristic is used to categorize them as a defaulter or otherwise.

Analysis of repayment performance by binary responses does not show whether a given covariate significantly explains credit repayment and if it does; how. Indeed, the choice to repay credit is not strictly binary [15] but continuous. If binary choice models are used to measure how factors explain repayment, a lot of information is foregone in such discrete responses [16].

The Tobit model is appropriate since it has the ability to put restrictions on the values taken by the regressand Maddala [11] such as the proportions of ISFG paid by the beneficiaries. Such an analysis has been adopted before by Feronze *et al*., [17], Abebe [18] and IFPRI [8] to study credit repayment.

$$Y_{ij} = X'\beta + \varepsilon_j$$

(Y_L is the point of censoring)

$$Y_{ij} = 0$$

if otherwise

$$E\left[Y_i / \varepsilon_i > -X'\beta\right] = X'\beta + \sigma\lambda_i$$

$$\lambda_i = \phi(\beta) / \Phi(\beta)$$

Where Y_{ij} is the proportion of ISFG repaid by the jth beneficiary, $1 - Y_{ij}$ is that defaulted, and Y_{ij}^* is the likelihood of repayment of Y_i by the jth beneficiary.

5. The ISFG Repayment Models

The specified ISFG repayment models are guided by the theoretical influence of specific factors on credit repayment. The model is;

ISFG Repayment model for the food security farmers

$$Y = \lambda_o + \lambda_1 Dist + \lambda_2 FG\_belong + \lambda_3 Maj\_source$$
$$+ \lambda_4 HH\_size + \lambda_5 Educ + \lambda_6 Ent\_yield$$
$$+ \lambda_7 Exp + \lambda_8 Grp\_cpcty + \varepsilon$$

ISFG Repayment model for market oriented farmers

$$Y = \alpha_o + \alpha_1 Educ + \alpha_2 In PAY + \alpha_3 (AGE)^2$$
$$+ \alpha_4 Landsize + \alpha_5 Innovcosts + \alpha_6 In(Returns)$$
$$+ \alpha_7 HH\_gender + \alpha_8 Ent\_yield$$

ISFG Repayment model for a pooled sample farmers

$$Y = \beta_o + \beta_1 Educ + \beta_2 Delaytime + \beta_3 Dist$$
$$+ \beta_4 Exp + \beta_5 Trainingno + \beta_6 Farmercate$$
$$+ \beta_7 Landsize + \beta_8 Grpccty$$

DIST =Distance in Kilometers of the beneficiary's home from the administrative unit for ISFG implementation.

FG_BELONG =Dummy for belonging to a farmer group or not. (D=1 if yes, 0 if otherwise).

MAJ_SOURCE=Dummy for Major income source of the ISFG beneficiary (D =1 for agricultural farming and D=0 otherwise)

HH_SIZE =The size of a household measured by the number of economically active members there.

ENT_YIELD =Gestation period in months of the ISFG enterprises farmed.

EDUC   =Level of formal education of the ISFG beneficiary measured in years of completed schooling.

GRPCPCTY   =Dummy variable representing beneficiary perception on capacity of the group to recover the loan from member (1 =Group had capacity, 0= otherwise).

AGE   =Age of the ISFG beneficiary in years

ISFG_COSTS   =The transaction cost the ISFG beneficiary incurs in receiving the credit in Uganda Shs

RETURNS   =Amount of money received from sale of ISFG enterprises.

LANDSIZE   =The size of land under farming given in acres.

HH_GENDER   =The gender of the household head (Where D=1 if the head is female, otherwise D= 0)

INNOVCOSTS   =Costs incurred by the farmer as a result of taking up ISFG given enterprise.

DELAYTIME   =The number of days for which the ISFG given enterprises delays behind the season.

EXP   =Experience of the ISFG beneficiary in credit use.

TRAININGNO   =The number of trainings attended by the beneficiary.

Beneficiary distance from the credit administration explains repayment because beneficiaries nearer to the credit administrative unit can easily be monitored and supervised. They also more easily and often benefit from extension services and are thus expected to pay higher proportions of the loan. Chauke *et al.*, [19] also found distance to have a significant influence on repayment of loans whereby farmers farther away would pay less of the credit.

When enterprises take long to mature, production costs and risks become high and consequently compromise credit repayment. Therefore, farmers who have enterprises of shorter gestation period should pay higher proportions of ISFG. Hunt [20] indicated that extending credit to enterprises with long-time to maturing period (like coffee and cotton) may lead to net loss to farmers.

Credit beneficiaries who belong to groups can be managed and penalized by internal rules of conduct in their groups. Groups also confer support, monitoring, joint liability and pressure to fellow members thereby removing moral hazards. Therefore; belonging to a group or not; and group capacity to influence members determines credit repayment. In Haryana, Feronze *et al.*, [17], proved that belonging to a group or not significantly affect credit repayment. Oke *et al.*, [21] also indicated that groups' capacity to exert pressure on member beneficiaries had a positive effect on credit repayment.

The variable ISFG_COSTS is included because farmers usually incur some level of transactions costs in order to receive loans. Costs are a burden to any business and reduce net profit. Farmers who incur higher costs are more likely to pay less or even default the credit. Zia [22] in his work on effective costs of rural loans in Bangladesh proved that borrowers incurring higher transaction costs of

borrowing will actually bear high effective rates of interest on their loan which decreases their repayment likelihood.

Education is the driving force behind any strong economy and is a prerequisite for social and economic growth. Education provides society with a better knowledge and skills necessary to stimulate development. Therefore more educated beneficiaries should have better managed enterprises and managerial skills and thus pay higher ISFG proportion. Oni *et al.*, [23] noted that an increase in the educational level of the loan beneficiary decreases the probability of the farmers' defaulting on loan repayment. We hypothesized education to have a positive effect on ISFG repayment.

Engaging in other non-farm activities to receive off-farm income augments farm income and farm credit repayment because farmers commonly use off farm income to offset any shortages in funds for agricultural activities. What farmers consider as a main income source should therefore influence how much of agricultural credit they can repay. We hence consider this dummy in the credit repayment model, D =1 if it is farming, otherwise D = 0. Also among Yam farmers in Ghana, Wongnaa and Awunyo, [24] noted that the farmer major income source determines the volume and value of production and consequently what proportion of credit repaid.

Land size worked is one measure of the scale of operation and farm size. Land size was proved to explain credit repayment in Oladeebo and Oladeebo [25]. Repayment of credit by smallholder farmers in Osun State in Nigeria depended on land area as a worked. Increasing farm size is an incentive to sustain productivity and expand production capacity of the farm. Therefore farmers who work larger land sizes should pay higher proportions of the ISFG credit. The variable land size is therefore included and expected to bear a positive sign.

Training assists farmers to learn, retain and upgrade their skills for better enterprise productivity (Uganda Debt Network UDN – 2010). Therefore farmers who had more training were expected to pay higher proportions of the ISFG. Accordingly, the variable TRAININGNO is expected to have a positive sign.

How better credit is managed (and repaid) depends on the gender of the beneficiary because gender distributes roles between men and women defining their daily activity calendars. In Wongnaa and Awunyo [24], females were found to be more disciplined borrowers than males and would make sure production resources given to them are used for their intended purposes. Grameen [15] also noted to be effective users of credit. Since in a household the head is pivotal to all decisions including the decision to repay ISFG or not, we include the dummy for household gender in ISFG repayment model.

6. Empirical Findings/Results

Tobit regression analysis was used to establish factors influencing the proportion of ISFG credit paid by its beneficiaries. Three separate models were run; one for food security another for commercializing farmers and then for a pooled sample. The dependent variable was the proportion of the credit paid back by the farmer computed

from the amount the beneficiary had paid back compared to what they were supposed to pay. The proportion ranged between 0≤Y≤1, where Y = 0 implies total default and Y=1, the beneficiary has paid fully.

Explanatory variables were chosen following Oni *et al* [23]; Wongnaa and Awunyo [24] basing on the presumed theoretical importance of the variable on credit repayment. Table 3, Table 4 and Table 6 present the results of the regression.

The four factors that significantly influence credit repayment among market oriented farmers as indicated in Table 3 were; education level of the beneficiary, the amount the beneficiary has to pay back, returns to the enterprises and the innovations costs introduced by ISFG beneficiaries.

The coefficient associated with innovation costs is negative and significant at 5%. This indicates a negative relationship of costs and credit repayment earlier argued by Nogbu and Walter [26]. New enterprises require farmers to innovate thereby increasing costs. Given the marginal analysis, a unit shs increase in natural log of these costs would reduce credit repayment likelihood by 12.8% conditional that the beneficiary pays.

In Table 3, the coefficient associated with the amount to pay back is negative as expected. Further analysis gave marginal effect of -0.1454 conditional that the beneficiary pays a certain amount and -0.2005 unconditional on the amount repaid. Therefore; for a one shs increase in the logarithm of the amount charged to the beneficiaries to be repaid, the likelihood of repayment would decrease by 14.5 % if the beneficiary chooses to pay. This finding is plausible because telling farmers to pay back a higher amount implies an effective increase in the interest rate which discourages repayment.

Table 3 shows a positive and significant relationship between the returns to enterprises and the likelihood of repayment. If the natural log of returns to the enterprises increased by a unit, there would be an increase of 10.4% in the probability of repaying ISFG among the market oriented farmers (Table 3). Indeed Wadonda [12] argued that enterprise performance influences both credit access and repayment.

Table 3. Tobit regression results showing determinants of ISFG repayment among market oriented farmers

Variable	Coefficient	t-value	Marginal effects	
			Unconditional (d[E(y/x)/dx]	Conditional (d[E(y>0/dx)/dx]
Constant	-1.6715	-0.56		
Reciprocal of education	7.6656**	2.39	3.8579	2.7993
In (Amount to pay back)	-0.3983*	-1.39	-0.2005	-0.1454
Square of Age	-0.0017	-0.001	0.0004	-0.0003
Land size	-0.1393	-1.500	-0.7014	-0.0509
Gender of household head	-0.1400	-0.23	0.0074	-0.0543
Innovation costs	-0.1520**	-2.25	-0.7580	-0.1282
In returns to ISFG	0.3512*	2.07	0.1767	0.0104
Ent_yield	-0.0286	-0.87	0.0144	-0.0536
MacFadden Pseudo R^2	16.24%			
Loglikelihood ratio	-117.7			
Prob Chi2	0.008			

Source: Field data analysis, 2013. ***, **, * significant at 1, 5 and 10%.

Table 4. Tobit regression results showing determinants of ISFG repayment among food security farmers

Variable	Coefficient	t-value	Marginal effects	
			Unconditional (d[E(y/x)/dx]	Conditional (d[E(y>0/dx)/dx]
Distance from the sub-county	-0.2894**	2.48	0.1600	0.1139
Belonging to a functional group	0.2637*	1.58	0.1459	0.1039
Major source of income	0.6340	0.78	0.3369	0.2417
Household size	-0.0031	-0.03	-0.0017	-0.002
Education level of the beneficiary	0.2052*	2.06	0.1135	0.8077
Maturity period of ISFG enterprise	-0.3431**	-2.30	0.1898	-0.1350
Beneficiary's experience in credit use	0.2323*	1.69	0.1285	0.0914
Group capacity to recover credit	1.7510*	1.36	1.3851	1.1205
Constant	-0.082	-1.06		
MacFadden's Pseudo R^2	0.1740			
Loglikelihood	-186.17			
Prob > Chi (2)	0.000			

Source: Field data analysis, 2013. Significant at 1, 5 and 10%.

Table 5. Tobit regression results showing determinants of ISFG repayment among food security farmers

Variable	Coefficient	t-value	Marginal effects	
			Unconditional (d[E(y/x)/dx]	Conditional (d[E(y>0/dx)/dx]
Education	0.1506*	1.83	0.0782	0.0563
Days for which ISFG delays	0.0175	1.18	0.0091	0.0066
Distance	0.3586***	3.31	0.1862	0.1341
Experience	0.2568**	2.06	0.1333	0.0961
Number of trainings	-1.936	-1.53	-0.1005	-0.0724
Beneficiary's category	0.9304	1.11	0.4831	0.3480
Land size	-0.1530	-1.50	-0.0794	-0.0572
Enterprise yield period	-0.3166***	-3.19	-0.1644	-0.1184
Belonging to farmer group	0.1607*	1.69	0.0834	0.0600
Age	0.0129	0.54	0.0067	0.0048
Constant	-2.286	-1.23		
MacFadden's Pseudo R^2	18.14%			
Loglikelihood ratio	-102.23195			
Prob>chi (2)	0.000			

Source: Field data analysis, 2013. Significant at 1, 5 and 10%.

In Table 4, ISFG repayment among the food security farmers was significantly influenced by; beneficiary distance from credit administration center, beneficiary education level, enterprise maturity period, experience in credit use, belonging to a farmer group or not; and group capacity to recover credit (Table 4).

Given the coefficient corresponding to the variable distance, there is a positive relationship between beneficiary isolation from the sub-county and credit repayment. There would be a 16% increase in the likelihood of repayment if the distance of the beneficiary increased by one kilometer for the beneficiaries who choose to pay. Credit beneficiaries farther away are more likely to pay back ISFG perhaps because they are more monitored and cared for compared to those nearer the sub-county.

Belonging to a farmer group significantly bears on credit repayment because the coefficient associated with the variable is positive and significant (Table 4). Credit beneficiaries who belong to functional farmer groups are 10.3% more likely to pay than those who don't.

The education level of the beneficiary also bears positively and significantly on repayment of the credit among the ISFG beneficiaries. The marginal effects indicate that the likelihood of credit repayment would increase by 80.7% if the beneficiary attended an additional year in formal education. The finding is plausible since education increases capacity of farmers to utilize technologies.

Perception of farmers on capacity of their group to recover credit from them also influences ISFG repayment significantly. Based on marginal analysis in Table 4, farmers who perceive their groups to have such capacity are 112% more likely to pay back the credit than those who think their groups do not have the capacity.

The period of maturity of enterprises given to the beneficiaries under the ISFG scheme also bears significantly but negatively on credit repayment given a negative coefficient associated with this variable (Table 4).

As enterprises take one additional month longer to mature, the likelihood of repayment decreases by 11.4% conditional on fact that the beneficiary pays any amount. This could be case because longer maturing enterprises present higher production costs and risks that negate repayment.

The credit use experience explains ISFG repayment significantly among the ISFG beneficiaries.

7. Recommendations

Since enterprise yield period significantly and influenced repayment of the ISFG, it is recommended that enterprises which yield within one farming season such as beans, maize and ground nuts be promoted under the ISFG credit scheme rather than those which take long to yield such as coffee and pineapples.

The distance the farmer is isolated from the sub-county affected ISFG repayment significantly and positively whereby repayment likelihood increased with distance the beneficiary is isolated from the sub-county. The sub-county should therefore strengthen extension and monitoring farmers that are close to it.

Farmer educational and adult literacy programs should be integrated in the ISFG credit scheme to augment its repayment because education level of beneficiaries positively and significantly influenced ISFG repayment. Additional years in formal education of the farmer increased the repayment likelihood. Educational opportunities also enhance group capacities to recover credit from fellow group members yet group capacity also significantly explained ISFG repayment.

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