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The Influence of Non-Equity Financing on Maize Production in Uasin Gishu County, Kenya

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Abstract
Uasin Gishu County produces about 3.29 million bags of maize, which is 14.3% of the national output of 23 million bags. The production is associated with increasing cost, yet the area under production has at most stagnated. This brings to fore the question of financial requirements. To understand this puzzle, this study sought to answer the question regarding farmers' financial requirements.
To achieve this, the study evaluated and established the existing relationship between usage of loan facilities and maize production. Using exploratory survey design, 384 maize farmers were sampled and the data collected was analyzed using descriptive and inferential statistics.
The regression analysis model fit the data well to imply a significant relationship between credit financing and maize production. However, the chi-square analysis did not show any relationship between farmers perception of output in relation to credit use.
Keywords: Credit financing/Non-equity financing; Maize; Yield: Uasin Gishu; Kenya

Introduction
Agricultural sector is the leading sector in Kenya, in terms of employment, and over 85 percent of the rural populations derive their livelihood from it. Most of them engage in maize production.
With rising cost of production, which in 2009 stood at US$ 617 for the efficient producer, US$ 496 for the average producer, and US$ 344 for the inefficient producer, per hectare, and an output of 49.4 bags, 37.1 bags, and 24.7 bags for the efficient, average, and inefficient producer respectively (Tegemeo Institute, 2009), there is need for farmers to access and use credit financing.
In 2008, the Alliance for a Green Revolution in Africa (AGRA), in partnership with Equity Bank, the International Fund for Agricultural Development (IFAD) and Kenya's Ministry of Agriculture signed an agreement for a loan facility worth US$ 50million meant to accelerate access to affordable financing for 2.5million farmers and 15,000 value chain members (AGRA, May 2008). Farmers need financial support so that proper and sufficient farm inputs can flow into agricultural regions and trigger a production response. Agricultural Finance Corporation (AFC) provides seasonal crop credit to maize farmers. This loan is for production of hybrid maize (AFC, 2009).
There had been a tremendous growth in maize production in Kenya from independence, up to around 1997(Karanja, et al., 1998). However, maize production has stagnated over the last 10 years in Kenya, and significantly in Uasin Gishu (Appendix 1), leading to shortages and increased quantities of imported maize.
Lack of credit translates into inadequate working capital, and farmers are unable to purchase productivity-enhancing inputs such as hybrid seeds and fertilizers. Kenya's "grain basket" zones incur higher costs of production than the major maize growing areas of Uganda (Nyoro, Kirimi and Jayne, 2004). In the absence of price supports and open trade between Kenya and Uganda, competition from maize imports from Uganda has negatively affected Kenya's maize surplus areas (Kibaara, 2005).
In spite of credit facilities being readily available to maize farmers, production has stagnated over the years and there was need therefore to establish why this was so and determine what needs to be done to reverse the situation. Farmers require finance to purchase productivity-enhancing inputs such as hybrid seeds, fertilizers, pesticides, and land preparation. This scenario pointed to a need to determine whether there is a relationship between agricultural financing and maize production.
The study aimed at determining the level of maize production at the farm level in Uasin Gishu County, determining the usage of loan facilities among maize farmers in the county, and establishing the relationship between usage of loan facilities and maize production.
The study tested the hypothesis that no relationship existed between loan facility usage and maize production in Uasin Gishu County.

Materials and Methods
This study used a model that related input and proxies for financial use. This model states that:

$$Y = f(X_i)$$

Where: Y stood for output (maize yield) and X_i, the input (credit financing/cost of production) representing various farm inputs such as seeds, fertilizer, pesticides and herbicides. The model is derived from the Cobb-Douglas production function theory which is, perhaps, the most widely used production function (Browning & Zupan, 2004) and which takes the form:

$$Q = AK^{\alpha} L^{\beta}$$

Where α and β are numbers between zero and one, and A can be any positive number (Frank, 2006). The multiplicative form of Cobb-Douglas production function is widely used in economics because it has properties representative of many production processes. Production economics theory deals with production of goods using a set of inputs. A production function is a model used to formalize this relationship; such as:

$$Q = f(L, S, F\ldots).$$

Where Q represents a farmer's output (maize, in our case), L may represent the amount of labour, S represents quantity of seeds used in production of Q, while F represents the amount of fertilizers applied (funds are required to finance all these). The objective of the producer, or farmer, is to maximize profit either by increasing the quantity of Q produced or by reducing the cost of producing Q (Webster, 2003). The production function shows the maximum amount of the good that can be produced using alternative combinations of labour (L), seeds (S) and fertilizer (F).

Methodology

The study used the exploratory survey design. The study explored the use of non-equity finance by maize farmers in Uasin Gishu County. It investigated the relationship between non-equity financing and maize production.

It looked at the cause-effect relationship between the two variables. This design was adopted for this study because the independent variable, that is credit financing, was to be studied and its effect on the dependent variable (maize production) determined.

It was also considered the best design for the research since issues such as attitudes, ideas, comments, and public opinion on the problem were also studied.

Target Population

The study was conducted among the 134,491 farm holders (KFSSG, 2008) in the greater Uasin Gishu County. The area of study was chosen using a combination of multistage and convenience sampling techniques. It was chosen because it is at the heart of Kenya's maize growing zones.

Research Instruments

The researchers used research schedules and interviews as the main data collection tools. The selection of these tools was guided by the nature of data to be collected, the time available, as well as by the objectives of the study. Interviews allowed the researchers to obtain information that could not directly be observed, obtain historical information, and gain control over the line of questioning.

The use of semi-structured instruments enabled the researchers to balance between qualitative and quantitative data and provided more information.

Sample and Sampling Procedures

The researchers used the confidence interval method of sample size determination (Appendix II). The sample therefore consisted of 384 maize farmers. The study employed the stratified random sampling technique to select the sample, strata being the administrative divisions and farmers being selected proportionately to the number of farm holding in each of the six divisions of the Uasin Gishu as shown in Appendix III.

Data Collection Procedures

The data collected included the socio-economic variables of the farming community such as labour, land size, financial requirements for the acquisition of factors of production, and maize output levels.

To collect this data, the researchers used schedules and interview techniques. This allowed them to obtain information that could not be directly observed, obtain historical information, and gain control over the line of questioning.

Interviews were useful to the researchers in collecting data since some of the respondents were illiterate.

Data Analysis Procedures

Data was analyzed using both descriptive and inferential statistics. Descriptive statistics included percentages, bar graphs and charts. The mean, standard deviation, and mode were also computed. This enabled the

researchers to describe the aggregation of raw data in numerical terms. Descriptive analysis was used to capture the level of maize production and also the usage of loan facilities among maize farmers in the district.
Inferential analysis was used to draw conclusions concerning relationships and differences found in the results. Inferential statistics included t-statistics, and chi- square values. Regression analysis and chi-square tests were used to measure association between agricultural financing and maize production.
Regression analysis is used when the study is about prediction of variables from other predictor variables. The model below was used to determine the relationship between maize yields and the cost of production per hectare. Aggregation of the cost elements was done since the analysis aimed to demonstrate that cost and yields are related and that credit can be used as a proxy for cost and vice versa.

$$Y = A + b_i X$$

Where, Y is the output (dependent variable); A is the intercept coefficient; b is a constant; and X is the input (independent variable).
Chi-square test was used to show the particular frequency of respondents preferring use of non-equity financing and to give the face values of implications of increased agricultural financing on maize production. The test was most suitable here since it enabled the researchers to identify whether there were any significant differences in the frequencies of the alternative responses.
All data was analyzed at a level of significance of 95% or $\alpha = 0.05$ and the degrees of freedom depending on the particular case were determined. This value ($\alpha = 0.05$) was chosen because the sample size was adopted from figures calculated on the basis of 0.95 level of confidence.

Results and Discussion

The results of the analysis show that the average farm output is 31.83 bags of maize per hectare (Appendix IV). This level of output is low and use of credit by farmers with limited resources can raise yields tremendously. This is evidenced by the fact that more than 11% of the farmers are producing over 40 bags per within the same region and which has similar climatic conditions.
Data analysis revealed that only 30.56% of the farmers use credit financing. This is a low level of credit use given than loan facilities are readily available today compared to 20 years ago. Farmer education is needed to enlighten them on the benefits that can be derived from use of credit to ensure acquisition and use of proper and sufficient farm inputs.
On the relationship between usage of loan facility and maize production in the district, the regression analysis model fit the data well to imply a significant relationship between credit financing and maize production (Appendix V). However, the chi-square analysis did not show any relationship between farmers' perception of output in relation to credit use (Appendix VI). The critical value at 1 degree of freedom and a significance level of 0.05 is 3.84. Since the calculated chi-square value of 0.784 is less than the critical value of 3.84, the null hypothesis is accepted. However, the farmers' perceptions are not scientific, but represent their feelings.The number that uses credit is 30.56%. Perceptions that show likelihood of output increasing when credit is used is 87.5%. This figure is high. Low level of credit use does not support farmers' perception for higher output when credit is used.
To improve maize production in the region, various measures and interventions must be undertaken by all the stakeholders, and in particular the government, to ensure accessibility and use of loan facilities by farmers.
The study established that the average maize output in Uasin Gishu County is 31.83 bags per hectare, with a standard deviation of 6 bags. The highest reported output was 49 bags per hectare, and the lowest stood at 24 bags, giving a range of output of 25 bags.
The study determined that only 30.56% of the farmers used credit. Though regression analysis results show a high correlation between credit use and output, chi-square analysis on farmers' perception does not show such a relationship. Low use of credit among the farmers could have led to the perception that credit use has no relationship with output.
The study established that with affordable credit financing, maize output levels in the region can be raised by up to 50%. In view of these findings, the researchers concluded that more farmers' access to and use credit financing is critical as it will enable them to purchase productivity-enhancing inputs such as hybrid seeds, fertilizers, and pesticides. Adequate land preparation would also be enhanced and maize production would be increased in Uasin Gishu County.

Conclusion

The study established that the average maize output in the county is 31.83 bags and that only 30.56% of the farmers use credit financing. Based on these findings, the researchers recommend that the government should intervene using measures that may include fiscal policies, persuasion, and direct intervention to influence lending rates for agricultural finance so as make credit accessible and affordable to farmers. The average rate of

interest of 16.35% is too high for majority of the farmers.

Maize production in the county is low, but there is potential for increased production using non-equity financing. This may be achieved with lower interest rates and more friendly credit terms such as flexible interest rates and monthly repayments. Since most of the arable land in the county is already under cultivation, one way to increase yield per unit area is by increasing technical efficiency through the use of appropriate quality and quantity of inputs. This may only be possible where financing is readily available, accessible, and affordable.

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Appendices

Appendix I: Maize Production in Uasin Gishu County: 2000-2009

Year	Area Under Maize (Hectares)	Output (90 Kgs Bags)
2000	62,000	2,604,000
2001	62,000	2,356,000
2002	49,000	1,372,000
2003	55,917	1,957,095
2004	63,585	2,098,305
2005	65,784	2,872,305
2006	68,000	3,060,000
2007	66,000	3,290,460
2008	62,815	3,314,380
2009	65,827	3,287,420

Source: Ministry of Agriculture, Uasin Gishu Conty Office (2013)

Appendix II: Sample Size Formula

The sample size was determined using the formula:

$$n = \frac{Z^2pq}{e^2}$$

Where; n = sample size (where target population is greater than 10,000)

Z = standard error associated with the chosen level of confidence (1.96)

p = the proportion in the target population estimated to have the characteristic of interest

q = 1- p

e = acceptable sample error (the level of statistical significant or confidence level).

Under this method, as there is no estimate available of the proportion in the target population assumed to have the characteristic of interest, 50% (or 0.5) was used. Therefore, with the proportion having the required characteristic (p) being 0.5, the Z-statistic was 1.96 and for the desired accuracy (e) at 0.05 level of significant, and the sample size was given by:

$$n = \frac{Z^2pq}{e^2} = \frac{(1.96)^2(0.5)(0.5)}{(0.05)^2}$$
$$= 384$$

Appendix III: Sample Size f Respondents

Stratum (Division)	Target Population	Ratio (%)	Sample Size
Soy	34,056	0.0029	97
Moiben	17,691	0.0029	51
Turbo	26,072	0.0029	75
Kesses	16,254	0.0029	46
Ainabkoi	15,896	0.0029	45
Kapseret	24,522	0.0029	70
TOTAL	134,491		384

Source: MOA, GoK (2008) and authors' data (2013)

Appendix IV: Maize Output at Farm Level

YIELD(BAGS/HECTARE)	
Mean	31.833
Standard Error	0.5007
Median	30
Mode	27
Standard Deviation	6.0082
Range	25
Minimum	24
Maximum	49

Source: Authors' data (2013)

Appendix V: Regression Analysis Results

	Coefficients	*Standard Error*
Intercept	3.158453541	3.472644499
COST/Ha	0.000922083	0.000103107
R Square	0.655672901	
Adjusted R Square	0.647474637	

Source: Authors' data (2013)

Appendix VI: Chi-Square Analysis

Credit affecting output	Credit users	Non-users	Total
	(Observed frequencies)	(Observed frequencies)	
Yes	39	87	126
No	5	13	18
Total	44	100	144
	Credit users	Non-users	
	(Expected frequencies)	(Expected frequencies)	
Yes	38.5	87.5	126
No	5.5	12.5	18
Total	44	100	144
	chi-square value	0.784464755	

Source: Authors' data (2013)

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