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Factors Influencing Maize Production in Sikasso Region of Mali

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Abstract

This study examined the contribution of subsidized inputs to farmers' level of maize production in Sikasso region of Mali. A multistage sampling procedure was used to select 200 beneficiaries of input subsidy for this study. Structured questionnaires were used to collect data which were analysed using descriptive and inferential statistics such as Chi-square, Pearson Product Moment Correction (PPMC), ANOVA and regression at 0.05 significant level. Results reveal beneficiaries' mean age to be 48.50 years. Almost all (99.0%) beneficiaries were males and married, while 63.5% had informal education. Mean farm size and mean seasonal income were 3.18 ha and 259,250 Fcfa ($432) respectively. Subsidized inputs that were mostly used and accessed by beneficiaries were UREA and NPK fertilizers, while Diammonium phosphate, organic fertilizer and hybrid seeds were least accessed and used. Inadequate financial capability to purchase inputs despite being subsidized and insufficiency of inputs were the major constraints faced by beneficiaries. Farm size (r=0.57, p≤0.01) and income (r=0.271, p≥0.01) were significantly related to respondents' production level. Significant difference exists in the level of maize production among beneficiaries' groups (f=8.646, p<??0.01). The study concludes that farm size and farmers' income contributed more to farmers' level of maize production. This study recommends that credit should be made available to maize farmers by government, NGOs or other financial institutions with little or no collateral. Also, hybrid seeds that could be preserved till the next planting season should be developed so that farmers' utilisation of hybrid seeds will be encouraged.

Keywords: Farm size, income, maize production, farmers

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Introduction

Maize (*Zea mays*) is one of the most important cereals in Mali. Since its introduction some centuries ago, maize has been the most dominant cereal crop in Southern Mali, precisely Sikasso region. After cotton, maize is a high significant component of the farming system due to its fast growing pattern. Today, maize utilisation goes beyond human consumption. It is highly used for livestock feed production especially by poultry farmers. This had led to increase in the demand for maize in the market. In 2008, as most countries, Mali has known grain crises due to economic crises in the world (Daniela and Auguste, 2009) which affected the agricultural sector in Mali through increasing fertilizer prices on the market. However, the level of maize production reached 2,092,033 tonnes in 2016 (26.0%) against 1,744,026 tonnes (20.0%) in 2015 (*Ministère de l'Agriculture de l'élevage et de la Pêche*, 2016)**.** However, International Fertilizer Development Center - IFDC (2015) asserted that in spite of the increase in quantities of maize produced, it has not been able to meet the demand of consumers. Hence, the need to devise ways such as introduction of subsidized inputs so as to increase farmers' production level. Each time that direct subsidies have been used to promote the use of seed and fertilizer, the results have almost always been disappointing (World Bank, 2008).

The Mali subsidy programme is essentially justified by the problems of productivity and production which arise in agro-ecological zones. These problems are commonly associated with factors such as lack of improved seed, poor quality and unavailability of fertilizer and low use of fertilizers. Usually those who grow cotton and rice benefit the major part of subsidised fertilizers because they are better organised. However, the subsidy programme was also extended to maize producers who also form a very large proportion of the farming population in Mali. It is therefore expected that this programme will positively impact on production of target crops among beneficiaries (IFDC, 2015). According to FAO (2012), a number of assessment studies have been carried out to ascertain the anticipated impacts of input subsidy programme, but have only focused on rice and cotton. Hence, this study examined factors influencing maize production in Sikasso Region of Mali.

Objectives of the Study

The objectives of the study were to:

1. determine respondents' access to subsidized inputs;
2. examine respondents' utilisation of subsidized inputs;
3. ascertain constraints faced by respondents in accessing subsidized inputs; and
4. assess respondents' level of maize production.

Methodology

The study was conducted in Sikasso region of Mali which is the second largest city in Mali with an area of 71 790 km^2. The region is situated in Southeast of Bamako in Mali, North of Ivory Coast and West of Burkina Faso. Sikasso is also a crossroads between the littoral countries (Togo, Benin, Ghana, and Ivory Coast) and non-coastal Mali and Burkina Faso. The population of this study consisted of all maize farmers who are beneficiaries of input subsidy in Sikasso region. Multi-stage sampling procedure was used to select respondents for this study. At the first stage, two *circles*

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- Kadiolo and Koutiala were randomly selected from the seven *circles* in Sikasso region. Kadiolo and koutiala had 9 and 36 *communes* respectively. At the second stage, 10% of *communes* were randomly selected to give 1 and 4 *communes* from Kadiolo and Koutiala respectively. These *communes* were Zegoua, Sincina, N'golonianass, kolonigue and KaragouanaMalle with 9, 7, 10, 8 and 5 villages respectively. At the third stage, 25% of the villages were randomly sampled to give a total of 10 villages. The number of beneficiaries of subsidized inputs in the selected villages was 1,995. At the fourth stage, 10% of the beneficiaries were randomly selected to give 200 respondents sampled for this study. The list of beneficiaries was gotten from institutions (*CompagnieMalienne pour le Developpement de Textile* - CMDT - Cotton company in Mali and *Direction Regional de l'Agriculture* - DRA - Regional Department of Agriculture in Mali) responsible for subsidized inputs distribution in the villages. Interview schedule was used to elicit data from respondents. Data collected were presented using descriptive statistics such as frequency, percentage, mean and weighted mean while inferential statistics such as Chi-square, Pearson Product Moment Correlation, ANOVA and regression were used to test hypotheses of the study.

Beneficiaries' accessibility to subsidized inputs was measured using a 3-point scale of always, occasional and never with scores of 2,1 and 0 assigned respectively. Utilisation of subsidized inputs was measured using a 3-point scale of totally utilised, occasionally utilised and not utilised with scores of 2,1 and 0 assigned respectively. Constraints faced by beneficiaries in accessing subsidized inputs were determined by using a 3-point scale of major, mild and not a constraint with scores of 2, 1 and 0 assigned respectively. In addition to the use of percentages, weighted mean value for each item on accessibility, utilisation and constraints were computed and used to rank the items for the three aforementioned variables. Level of maize production was determined by asking beneficiaries to indicate quantity of maize produced in year 2016 in tonnes. Mean of tonnes of maize produced was computed and used to categorized beneficiaries as either having high level of production for those with quantity of maize produced equal to and above the mean or low level of production for those with quantity of maize produced below the mean.

Results and Discussion

Socioeconomic Characteristics

Table 1 reveals that 40.5% and 30.5% of respondents were within the age groups of 35-47 and 48-60 years respectively. The mean age was 48.59 years, implying that beneficiaries are more of adults compared to youths. Respondents' mean age was closed to that reported by Oladejo and Adetunji (2012) who conducted a study among maize farmers in Oyo State, Nigeria and found their mean age to be 45.8 years. However, Ajah and Nmadu (2012) conducted a study on small scale farmers' access to maize input in Abuja, Nigeria and found average age of farmers to be 39.0 years. Almost all (99.0%) of the respondents were males, implying that men were the main beneficiaries of subsidized inputs and are predominantly involved in maize production in the study area. This result corroborates the findings of Garcia, Nyberg and Shayma (2006) that the past agricultural development interventions tend to focus on male

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maize producers at the expense of female maize producers because men form the largest percentage of the workforce in agricultural production in the rural area of Mali.

Most (99.0%) of the respondents were married and this could be due to the fact that people got married early in rural area of Mali and farming system is family based. All the family members cultivate the same land collectively and the farm is usually registered in the name of family chief. Hence, gender sensitivity is neglected in the study area by subsidy programme. The majority of the beneficiaries (63.5%) had no formal education, 24.0% had not received any form of education while 12.5% had formal education. The low educational level of respondents could have negative effect on their receptivity of innovations as previous studies have shown that producers who had high level of education are likely to adopt new technologies earlier and use inputs that make them more productive compared to those with low educational level (Afari, 2001). According to Iwaola (2014), education is an important factor in accessing subsidized inputs, agricultural information and in understanding the need for involvement in agricultural intervention programme such as input subsidy programme.

Table1 also shows that 54.5% and 30.5% of the respondents cultivated between 1.0-2.0 and 2.1-5.0 hectares (ha) respectively with mean farm size was 3.18 ha. All (100.0%) of the respondents belonged to social groups implying that they were organized system of producers. It is noteworthy that inputs are delivered to the various cooperatives and then shared among producers since they benefited as a group and not as individual. This implies that membership in social groups provided an opportunity for respondents to access subsidized inputs. This finding is in line with Ajah *et al* (2015) that farmers who belong to one form of social group or other tend to have access to farm inputs. It was found that 73.5% of the respondents earned a seasonal income between 3,000 - 303,000 *Fcfa* ($5 - $505) with a mean income of 259,250 *Fcfa* ($432). Furthermore, Table 1 reveals that all respondents got subsidized inputs from government institutions which are CMDT and DRA. Respondents who sourced subsidized inputs from CMDT and DRA only were 50.0% and 35.0% respectively, while 15.0% sourced inputs from both institutions.

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Table1: Socioeconomic characteristics of respondents

Variables	Percentage (n=200)	Mean	Std.deviation
Age in years			
21-34	11.5		
35-47	40.5		
48-60	30.5	48.59	12.63
61-73	14.5		
>73	3.0		
Sex			
Male	99.0		
Marital status			
Single	1.0		
Married	99.0		
Level of education			
No education	24.0		
informal education	63.5		
Primary education	12.0		
Secondary education	-		
Tertiary education	0.5		
Farm size (ha)			
1.0 - 2.0	54.5	3.18	2.72
2.0 - 5.0	30.5		
> 5.0	15.0		
Membership of social groups			
Yes	100.0		
Seasonal Income (*Fcfa*)			
3,000-303,000	73.5	259250.00	286592.90
303,001-603,001	19.0		
603,002-903,002	4.0		
> 903,003	3.5		
Sources of inputs			
Government	100.0		
Name of institution			
CMDT	50.0		
DRA	35.0		
DRA+CMDT	15.0		

Source: Field Survey, 2017

Beneficiaries' Access to Subsidized Inputs

Table 2 shows that subsidized inputs accessed by farmers include urea ($\bar{x}$ = 1.84), NPK ($\bar{x}$ = 1.84), Diammonium phosphate (DAP) ($\bar{x}$ = 0.6), organic fertilizer ($\bar{x}$ = 0.27) and hybrid seed ($\bar{x}$ = 0.04). Urea and NPK ranks 1stas the major inputs accessed by respondents while Organic fertilizer, DAP and hybrid seed ranks 2nd, 3rd and 4th respectively and these were least accessed by respondents. The low accessibility of hybrid seed by respondents could be attributed to low level of availability and high cost. IFDC (2015) reported that although the subsidy programme concerns all targeted crop producers, not all producers can easily access subsidized inputs. Corroborating this, maize farmers stated thus during the course of this survey that:

> *"though these inputs were subsidized, but failure to pay for those initially collected on credit makes it difficult for me to access another input".*

> *"I have made several attempts to obtain hybrid seed, each time I go there I will be told that they are not available".*

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"It is difficult to keep hybrid seed for cultivation in next farming season, as a result, I get discourage to cultivate hybrid seeds because you cannot keep them like the local seeds for next planting seasons".

Table 2: Beneficiaries' access to subsidized inputs

Inputs	Weighted mean	Rank
UREA	1.84	1st
NPK	1.84	1st
Organic fertilizer	0.27	2nd
DAP	0.06	3rd
Hybrid seed	0.04	4th

Source: Field Survey, 2017

Beneficiaries' Utilisation of Subsidized Inputs

Table 3 reveals that urea ($\bar{x}$ = 1.95) and NPK ($\bar{x}$ = 1.99) were used by most respondents. This could be attributed to the fact that most respondents had access to the aforementioned inputs. The majority of the respondents did not use DAP ($\bar{x}$ = 0.05), organic fertilizer ($\bar{x}$ = 0.15) and hybrid seed ($\bar{x}$ = 0.04). This could be attributed to the low level of accessibility of DAP, organic fertilizer and hybrid seeds. Findings from this study agrees with Sonwa *et al*. (2008) who identified inadequate access and high cost as major constraints to utilizing inputs in rural areas.

Table 3:Beneficiaries'utilisation of subsidized inputs

Inputs	Weighted mean	Rank
NPK	1.99	1st
UREA	1.95	2nd
Organic fertilizer	0.15	3rd
DAP	0.05	4th
Hybrid seed	0.04	5th

Source: Field Survey, 2017

Constraints to Accessing Subsidized Inputs

Table 4 shows that high cost of inputs ($\bar{x}$ = 0.75) ranked1st among the constraints faced by maize producers in accessing subsidized inputs. This could be attributed to the fact that respondents in the study area are small scale farmers with low income level and as such find it difficult to afford subsidized inputs. Insufficient inputs ($\bar{x}$ = 0.61) and unavailability of inputs ($\bar{x}$ = 0.58) also constituted major constraints to accessibility of subsidized inputs among maize producers. When inputs are not sufficient or available, it becomes difficult for producers to access them. Poor information on subsidized input ($\bar{x}$ = 0.13) and poor marketing strategy ($\bar{x}$ = 0.13) were the least constraints faced by maize farmers. The plausible reason for this could be attributed to respondents' membership in association which facilitates flow of information that could be of benefit to maize production.

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Table 4: Constraints to accessing subsidised inputs

Constraints	Weighted mean	Rank
High cost of inputs	0.75	1st
Inputs are not sufficient to meet maize producers need	0.61	2nd
Inputs not readily available	0.58	3rd
Remoteness of maize producers location	0.38	4th
Inadequate credit	0.30	5th
Input is of poor quality	0.27	6th
Inputs not easily accessible	0.27	6th
Poor information	0.13	7th
Ineffective marketing strategy	0.13	7th

Source: Field survey (2017)

Level of Maize Production in Year 2016

The result in Table 5 reveals that 62.5% of the respondents had low production level while 37.5% of them had high production level with a mean production of 61.48 tonnes. It could be deduced that this result is a reflection of the arrays of constraints faced by respondents in the study area.

Table 5:Distribution of beneficiaries based on their level of maize production

Level of production in tonnes	Percentages (n=200)	Mean	Standard deviation
Low (< mean)	62.5	61.48	58.79
High (≥ mean)	37.5		

Source: Field survey (2017)

Relationship Between Selected Independent Variables and Maize Production

However, the Pearson Product Moment Correlation between farm size (r= 0.57, p??0.01), income (r= 0.271, p<0.01) and maize production was significant but age (r= 0.114, p>0.109) was not significantly related to maize production. This implies that producers' farm size and income significantly affects maize producers' level of production. Thus, producers with high income level can afford subsidized inputs and other resources required for maize production. Also, the significant influence of farm size on production level suggests that the larger the farm size cultivated, the higher the expected output/yield. Hence, increase in maize production is linked to increase in land size cultivated for maize.

Table 6: Relationship between selected independent variables and maize production

Variables	χ^2	r-value
Age		0.114
Level of education	4.087	
Farm size		0.572*
Income		0.271*

***P ≤0.05. Source: Field Survey, 2017**

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Factors Contributing to Beneficiaries' Level of Maize Production

Independent variables were regressed with the level of maize production to determine their contribution to farmers' level of production. The result in Table 6shows that farmers' farm size (β=0.546, P<0.01) and income (β=0.167, P<0.01) significantly predicted farmers' level of production with percentage contribution of 54.6% and 16.7% respectively. The analysis indicated an R square value of 0.397, indicating that the independent variables in the regression model can only explained 39.7% contribution to the dependent variable. The non-significant variables are not important contributors to farmers' level of maize production in the study area.

Table 7: Factor contributing to beneficiaries' level of maize production

	S.E	B	t
(Constant)	240.193		
Sex	101.270	0.037	0.641
Religion	26.317	0.036	0.610
Marital Status	103.658	0.052	0.883
Education	16.322	-0.034	-0.585
Farm size	14.281	0.546	9.168*
Income	12.017	0.167	2.849*
Access	8.901	0.062	0.956
Utilisation	15.436	0.062	0.948
Constraint	3.640	0.017	0.299

R= 0.630; R^2 = 0.397; Adjusted R^2= 0.368; Std.Error= 140.2902; *= significant at p<0.01

Source: Field Survey, 2017

Conclusion and Recommendations

Farm size and income contributed significantly to farmers' level of maize production. The level of farmers' accessibility to and utilization of organic fertilizer, DAP and hybrid seeds was very low. Farmers' major constraint was inadequate capital to purchase inputs despite being subsidized.

Credit should be made available to maize farmers by government, non-governmental organisations and financial institutions with little or no collateral in order to boost their financial capacity. Organic fertilizer, DAP and hybrid seeds should be made available to farmers by institutions responsible for input distribution. Extension agents should encourage maize farmers to increase their farm size with respect to inputs within their reach.

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