Farmers' Decision to Purchase Quality Declared Seeds in Kongwa District, Tanzania

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Abstract
Maize is the staple food crops produced and consumed in Tanzania. However, among other things, production of maize has been limited by low use of quality seeds due shortage of supply and cost of supply of quality seeds, certified seeds in particular. As part of its efforts, the government of Tanzania adopted Quality Declared Seeds (QDS) production system in around year 2000 to promote quality seeds use. The general objective of the study was to generate evidences that may contribute towards upscaling of commercial small-scale seed production and distribution in Kongwa district. Specifically, the study estimates maize seeds consumption from different seed system and factors influencing farmers' decision to purchase QDS using binary logit regression. The study report is based on data from sample of 120 randomly selected maize producers (farmers). The study has shown that maize seeds consumption constituted of seeds obtained from own-saving (70%), QDS (15%), subsidized seeds (9%), other farmers (6%), input suppliers (0.1%) and seed kit programmes (0.1%). Furthermore, membership associations; access to subsidized seeds; demand for more varieties and higher income from agriculture increased the probability of farmers to purchase QDS while high use of own-saved seeds and seed exchange between farmers reduced purchase of QDS. This study recommends improving local seed systems (distribution); building capacity of farmers to produce and purchase QDS through subsidies and credits, and improving preferred local varieties for QDS production.

Keywords: Quality Declared Seed (QDS), Seed Systems, Maize

Background information

Maize is a major staple food crop produced and consumed in Tanzania and mainly produced by small-scale farmers both for food and as a cash crop. It is produced by about 7,431,144 farmers in an area about 6,067,996 ha (URT, 2017). Kongwa is among the main maize producing district with strategic maize market center at Kibaigwa town. Despite of the district potential in maize production, the crop yield in Kongwa is less than 1.5 MT per ha which far below potential production of up to more than 5 MT per Ha (Mkonda and He, 2017; URT, 2012). The low maize production is attributed among other things, the low use of quality seeds which their availability is not guaranteed in rural areas. Seed distribution system includes formal system (which supply certified seeds), informal (seed saving and exchange between farmers) and Semi-formal system which includes features of the other two. As one of the strategies to promote use of quality seeds among rural small-scale farmers, Tanzania modified and adopted semi-formal seed system through the Quality Declared Seed (QDS) scheme in 2001 and incorporated it in its Seed Act of 2003. The QDS is semi formal system and focus at improving seed security in rural areas through engaging farmers in production and marketing seeds in their localities.

Producers of QDS are registered trained small-scale farmer or a group of small-scale farmers for their own use or for sell to the neighboring farmers within the ward (URT, 2001). Kongwa district is among 90% of district which introduced Quality Declared Seeds in early 2000s (Granqvst, 2009). Zoissa Seed Multiplication (ZOSEM) is a group of 10 QDS

producers located at Zoissa Sub-division in Kongwa. However, QDS in maize seems to lag behind because farmers still rely on traditional sources. The objective of introducing QDS was to increase the availability of quality seeds for the smallholder farmers. The demand for maize seeds (at rate of 25Kg per Ha) in Tanzania seed demand per annum is about 151,700MT (URT, 2017). However, despite of availability of quality seeds including QDS, more than 83% farmers still rely on traditional sources (URT, 2012; AGRA, 2010; Mtenga (2001). In that regards it is therefore very important to understand why farmers in Tanzania do not prefer to use QDS with a focus on seed systems that governs country's seed business. This study intended to help ZOSEM to understand factors that influenced their customers to purchase their QDS and generate evidence that can help to make recommendations to policy makers and other stakeholders this seed system.

Study objective and questions

The general objective of the study is to unearth determinant factors that influence farmers' decision on purchasing quality declared seeds. Specifically, this study;

1. Determine the level of farmers dependency on existing maize seeds distribution systems
2. Identified factors influencing decision to purchase Quality Declared Seeds.
3. This study answers the following key questions;
4. What are the seed distribution systems used by farmers to access seeds in Kongwa district?
5. Which are the key factors influencing purchasing decision of Quality Declared Seeds?

Literature review

Theoretical literature review

The objective of this study was to identify which and how underlying factors affect farmers' decision to purchase maize Quality Declared Seeds. To reach this objective, the Theory of Planned Behaviour (TPB) was used as a main framework for understanding seed consumer behaviour. Ajzen (1991) postulates three conceptually independent determinants of intention in the theory of planned behaviour which are useful in understanding the decision of farmers to use QDS. The first is the attitude toward the behaviour and refers to the degree to which a person has a favourable or unfavourable evaluation or appraisal of the behaviour in question. The second predictor is a social factor termed subjective norm; it refers to the perceived social pressure to perform or not to perform the behaviour. The third antecedent of intention is the degree of perceived behavioural control which, refers to the perceived ease or difficulty of performing the behaviour and it is assumed to reflect past experience as well as anticipated impediments and obstacles. Despite of the limitations of the theory including less consideration of environmental or economic factors that may influence a person's behaviour; assuming that behaviour is the result of a linear decision-making process, and does not consider that it can change over time and; not addressing the time frame between intent and behavioural action, TPB has been adopted by number of studies in understanding behaviour to predict and understand people's intentions (Wong and Mulang, 2009; Sommer, 2011). In this case, the theory of planned behaviour was therefore adopted with assumption that farmers plan to buy QDS subject to a set of factors that influence such decision. Farmers decision to shift from dependence on informal seeds to QDS is important planned behavioural change that mark an important stage in Tanzania seed sector development. Therefore, it is necessary to start the analysis of the contribution of each seed distribution system in total seeds used by farmers in order to provide understanding of the extent of development of seed sector (Ayieko and Tschirley, 2006; FEWS, 2008; Kugbei and Shahab, 2007). Then the decision of farmers to purchase and use QDS needs to be analysed to identify how their social economic conditions influence their decision to purchase seeds from semi-formal seed sector. Variation in likelihood of use is proposed in measuring factors influencing buying of a particular commodity (Field, 2005).

Determinants of decision to purchase seeds

Seed sector develop as the farming

economy shift from dependence of informal to formal seed systems and involves farmers behaviour change. QDS is a critical stage in developing sustainable formal seed system (Granqvst, 2009; MAFC, 2001) by removing distance barriers for farmers to access quality seeds. However, limited access to credits, and extension service has negatively affected farmers decision to buy and quality seeds (AGRA, 2010; Mtenga *et al.,* 2001). Temu *et al.* (2011) using a logit model determined factors affecting use of quality maize seeds found that age of respondent, and higher income, access to credits, access to extension services, association membership influenced use of quality seeds. Farmers tend to buy seeds of varieties preferred in the market (ICARDA, 2009). However, experience shows that after buying of quality seeds of OPV and open pollinated crops, farmers continues to multiply such seeds for some years before renewing (Kugbei and Shahab, 2007; Lanteri and Quagliotti, 1997). Furthermore, seed buying has also been influenced by farmer ability to produce and save their own seeds, cost of seed (purchase plus transport costs) and price and availability of complementary inputs and price of crop produces (Horward *et al.,* 2000). Binary logistic regression has been used by in several studies such as Bardhana *et al.,* (2012); Katungi *et al.,* 2011; Keil and Nielsen (2012); Onoja *et al.,* (2012) and Temu *et al.,* (2011) to identify determinants of decision to buy and use different technologies among smallholder farmers. Table 1 shows binary logit explanatory variable and their expected signs as variables found in Bardhana *et al.,* (2012); Katungi *et al.,* 2011; Keil and Nielsen (2012); Onoja *et al.,* (2012) and Temu *et al.,* (2011).

Table 1: Definition of variables influencing use of improved seeds

Variables	Variable description	Expected influence on decision on seed purchase
Sex	1 = Male, 0 Female	Increase
Experience in maize production (years)	Continuous	Increase
Access to extension service	Accessed extension service=1, Otherwise= 0,	Increase
Membership in farmers association	Member of association = 1, 0 Otherwise	Increase
Access to credit	Accessed credit=1, Otherwise= 0,	Increase
Access to subsidy	Accessed subsidy=1, Otherwise= 0,	Increase
Experienced use of technology before last season	Not first time to use technology=1, Otherwise= 0,	Increase
Use of locally produced varieties	Used local variety 1, otherwise 0	Decrease
Quantity of seeds from another farmer	Continuous	Decrease
Quantity of own saved seeds used	Continuous	Decrease
Agricultural Income	Continuous	Increase
Number of varieties grown	Continuous	Increase
Ability to identify varieties used	Able to identify variety 1, otherwise 0	Increase
Price	Continuous	Increase

Methodology

Study area

Kongwa district constitutes among areas with high potential of maize production and among the districts where small scale seed production was introduced by on-farm seed production Collaborative Research Support Programme (CRSP) implemented in 1990s to early 2000s. Further, the district has the largest grain market in the country at Kibaigwa town. According to 2012 national population census and 2008/09 agricultural census report, the District population was 309 973) and about 57 % of its residents depend on crop farming mainly maize (URT, 2012;URT, 2013). This survey was done Zoissa and Chitego Wards with 1420 and 2130 households respectively (URT, 2013). Historically the two wards were one ward Zoissa before they were divided into two in mid 2000s.

Questionnaire pre-testing

The survey instruments were developed by the researcher and before data collection exercise questionnaires was pre-tested to see if they answer the stated objectives and their clarity to the respondents. A total of 15 questionnaires were administered during pre-testing of the questionnaire and the exercise was done in Kongwa Districts. After the pre-testing, modifications were made to the questionnaires and improved version of the questionnaires were developed and used to collect data.

Sample size and sampling

With known population, the sample size for this study was determined using Cochran formular as adopted in Bartlett (2001) (Equation 1);

$$Sample\ size\ (n) \geq \frac{\frac{z^2 \times p(1-p)}{e^2}}{1+(\frac{z^2 \times p(1-p)}{e^2 N}} \quad \text{.....(1)}$$

Where N = population size (in our case 3,550 households in Zossa and Chitego, the QDS market under study); e = Margin of error (in this case 10 % was adopted); z=z-score (in this case for confidence level=95% was adopted). The sample of 120 smallholder maize producers was then obtained using simple random sampling. The sampling frame was the list of farmers in Zoissa and Chitego wards.

Data collection methods

Both primary and secondary data collection methods were used to obtain the information required for the study.

Primary data

Data used in this study were largely primary data collected from the samples of respondents using Structured questionnaires, Focus Group Discussion (FGD), observation and semi-structured interviews with key informants. The questionnaires were designed for producers (farmers) where as FGD was done with ZOSEM members, semi-structured interview was done with District Agriculture Irrigation and Cooperative Office (DAICO) and observations was done through field visits in Zoissa, Chitego and Kibaigwa town.

Secondary data

These are data obtained from literature sources or data collected by other people for some other purposes. In this study secondary data were obtained from Journal published online, District Agricultural Offices; Reports published by the Ministry of Agriculture, Food Security and Cooperation, National Bureau of Statistics and other Institutions; Sokoine National Agricultural Library (SNAL) and Internet.

Data analysis

Farmer's decision of purchase is a qualitative that is based on probabilities of either choosing to or not. To understand how farmers', make decision on what seed to use or purchase the current study use logistic regression analysis because predicts the odds of being a case based on the values of the independent variables (predictors of QDS purchase). Several econometric and statistics literature explains the processes and theory behind this model (Dougherty, 2012 and Field, 2005). By using the logistic regression, the probability of a result being in one of two response groups (binary response) is modeled as a function of the level

of one or more explanatory variables. Thus, the probability whether or not to purchase maize QDS was modeled as a function of the level of one or more independent variables. For this study, the response variable is 1 when the farmer purchased maize QDS and 0 when did not. The functional form is denoted in equation (2).

$$\ln\left(\frac{P_i}{1-P_i}\right) = B_0 + B_1X_1 + B_2X_2 + \ldots\ldots B_nX_n \quad \ldots.(2)$$

Where dependent variable is a natural log of probability of purchasing QDS and Bi's are coefficients and Xi's are predictors. Binary logistic regression model provides probability to adopt QDS given set of independent variables. The hypothesis behind binary logit model is that all Bi's will be zero except B0. The Statistical Package for Social Science (SPSS) was used in regression analysis and MS Excel was used for descriptive analysis.

Results and discussions

Respondent characteristics

Table 2 summarizes characteristics of

Table 2: Respondent characteristics

Respondent characteristics		% of farmers
Sex	Men	67
	Women	37
Age groups	18-35	40
	35-45	45
	45-60	13
	Above 60	02
Education level	Not able to read and write	5
	Primary education	85
	Secondary education	5
	Post-secondary education	5
Have off farm income	Yes	33
	No	67
Membership in associations	Yes	51
	No	49
Access to extension services	Yes	53
	No	47
Access seeds on credit	Yes	45
	No	55
Land ownership (ha)	Mean	6.27
	Range (min-max)	0.5-10.2
	Std. deviation	7.1
Land rented in	Mean	2.5
	Range (min-max)	0-14
	Std. deviation	3.51
Hectares of maize	Mean	5.91
	Range (min-max)	0.8-10
	Std. deviation	3.2
Number of crops produced	Mean	3
	Range (min-max)	1-6
	Std. deviation	1

randomly selected respondents in percentages by sex, age group, education level, off farm income, membership of agrarian institutions, access to extension service and credit.

Table 2 indicates that only 37% of respondents were women but only 18% of women purchased QDS were women, this is discussed more in next section (Figure 1). Most of interviewed farmers are middle aged group (45%) and youths (40%) suggesting workforce coming from more active group of the population.

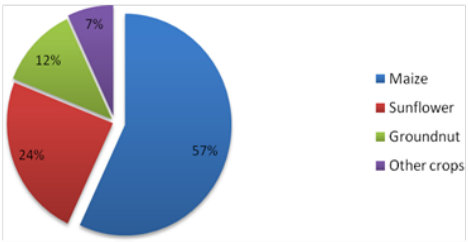

Figure 2: Agricultural land allocation to crops

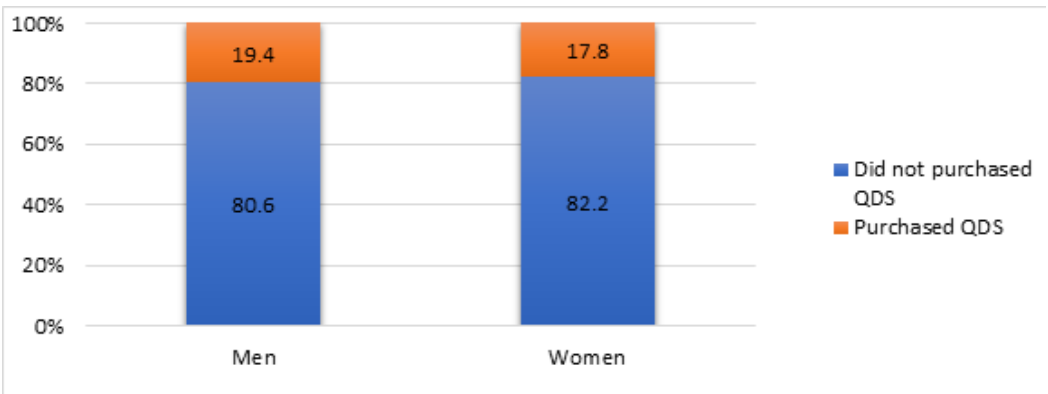

Figure 1: QDS use by gender

Furthermore, most of farmer had education enabling them to read and write whereas 5% had never been to school and did not know to read and write. Most of farmers (67%) depend on agriculture only as source of income, only 51% of them are member of farmers group, 53% access extension service and 45% accessed credit.

On average the land ownership was 6.27 ha per household whereby an average of 2.5 ha was rented-in and an average land allocated for maize production was 4 ha per household suggesting maize to be the main crop produced in the area. On average a farmer produces 3 crops but most of land (57%) was allocated to maize production (Figure 2).

Other major crops produced are sunflower, ground nuts and other crops including vegetables, sweet potatoes, cassava, sorghum and millet. Diversification is used as a strategy for more income, food varieties and minimizing the loss in case to weather risks.

Maize seed systems characteristics and consumption

Kongwa formal system includes input stores, Government Subsidized Seeds and Non-Government Organization (NGO) programmes (provided as free seed kit for variety awareness creation to farmers); and informal seeds system includes own saved seeds and other farmer (accessed in market centres, local shops, at home or as gifts) and Semi-formal system (Quality Declared Seed) (Table 3 and Figure 3).

a) **Formal seed system:** Only 9.2% of maize seeds used were obtained through the formal seed system. While fifty eight percent (58%) of farmers accessed seeds (10Kg of certified seeds provided per farmer through 50% price subsidy system which contributed of 9% of all accessed seeds (Figure 2). Only 2% of farmers bought certified maize seeds from private input suppliers without subsidy which constituted only 0.1% of total weight of used seeds and; three percent (3%) of

Table 3: Characteristics of maize seed system

Seed system	Sources of seeds	Unit of measurement	Price (TZS)
Formal system	Subsidized Certified seeds	Kg	1000
	Input supply stores	Kg	2000 - 4000
	NGOs seed aids	Kg	Free provided
Informal system	Own saved	Tin of 20 litres (approx. 18-22kg)	7000 to 10 000 (approx. 350-400 per Kg)
	Another farmer	Tin of 20 litres	Barter trade or 7000-10 000
Semi-formal	QDS producers	Kg	1250

farmers used 0.1% (all hybrid seeds) of seeds accessed from NGOs programmes. These findings suggest that Kongwa formal seed system was heavily relying on seed subsidy which may create a rigid sealed system which cannot meet and sustain seed needs (demand of about 100 kg per farmer) for diverse groups of farmers and discourage commercialization of small-scale seed production. No input stores for buying seeds were allocated district major towns Mkoka (11 km), Kongwa (57 km) and Kibaigwa (65 km) which are far from Zoissa area where survey was done. The findings have similar observation with Asfaw *et al.* (2008) that limited numbers of private seed enterprises in rural areas narrow the options available to farmers for obtaining quality seeds at affordable prices at the right place and time.

b) Informal maize seed system: The informal seed delivery system forms the main source of maize seeds. Own saved seeds were used by 70% of farmers and constituted of 69.9% of all maize seeds planted. The second means of source of seeds in informal system were other farmers (20%) which supplied 5.95% of all seeds used by farmers. These findings are similar to other previous studies such as Minot *et al.* (2007) which show that informal seed systems were the highly used sources of seeds despite of their lack of assurance of seed quality.

c) Semi-formal maize seed system: Private extension service provider known as Lay Volunteer International Agency (LVIA) established QDS production in Kongwa District in 1997 in Zoissa sub division

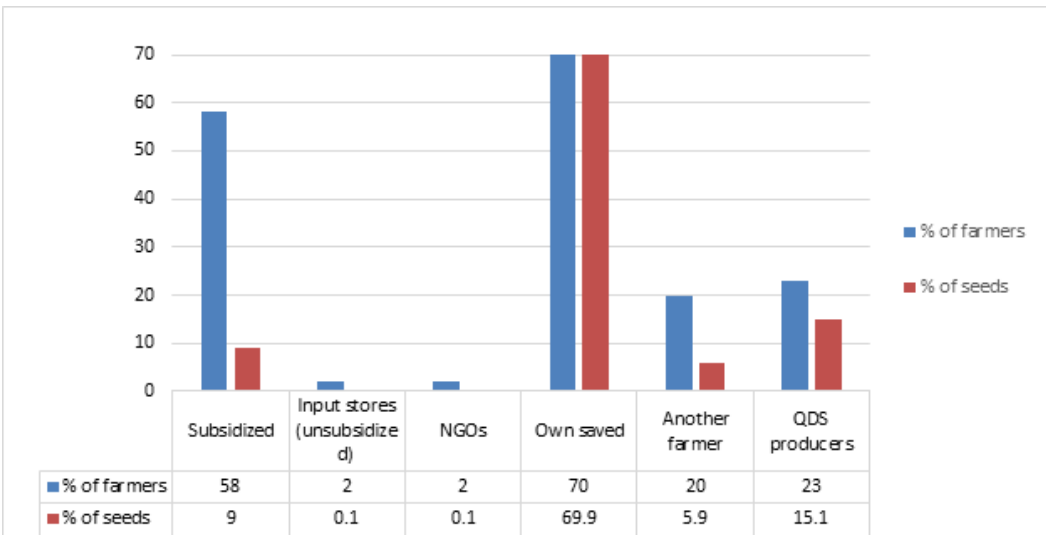

Figure 3: Seed consumption from various sources

through schools and farmers group including Zoissa Seed Multiplication Group (ZOSEM). Up to 2012 season only ZOSEM group with 10 members (50% of them women) was still producing QDS with capacity of supplying about 15 MT of seeds per year. The use of maize ZOSEM seeds was adopted by 23% of maize farmers in Zoissa sub division and constituted 15% of total maize seeds used. Maize QDS ranked third (23%) in terms of number of farmers used after own saved seeds (70%) and subsidized seeds (58%) and ranked second (15%) after own saved seeds (70%) in terms of volume of seeds used.

Factors influencing farmers to purchase QDS

The results from binary logit analysis with binary dependent variable 1 for farmers used QDS and 0 for farmers who did not suggested significant relationship between dependent (decision to purchase QDS) and independent (Gender, Experience in maize production (years), Access to extension service, Membership in farmers association, Access to credit, Access to subsidy (SS), Previous experience with QDS, Use of Local varieties, Quantity of seeds from another farmer, Quantity of own saved seeds used, Household income, Number of maize varieties grown, Ability to define varieties used and Maize Price (Tsh). The difference in likelihood follows a chi-square distribution, and is the model chi-square of 67.10, this Chi square has 14 degrees of freedom and a probability of $p<0.0001$, indicates that the model predictors have a significant effect on explaining the relationship between dependent variable use of maize QDS and predictors forming a different model (Table 4). The Nagelkerke's R^2 (0.679), indicates a moderately strong relationship between the predictors and use of maize QDS (Table 4).

Membership in groups: Membership in farmers' association/groups was an ordinal variable that is coded 1 for member and 0 for not member so that higher numeric values are associated with survey respondents who used QDS. The value of Exp (B) was greater than 1 (20.735) which implies that being a member of farmers association increased the odds that survey respondents used maize QDS. This finding is analogous to Monge *et al,* (2008) that

Table 4: Determinants of farmers' decision to purchase QDS

Predictors	Coefficients	Sig. of Wald	Exp(B)
Gender (GN)	-0.747	0.506	0.474
Experience in maize production (years) (EXP)	0.040	0.331	1.040
Access to extension service (ES)	1.515	0.225	4.547
Membership in farmers association (MI)	3.032	0.017**	20.735
Access to credit (CR)	-2.750	0.074*	0.064
Access to subsidy (SS)	3.066	0.066*	21.458
Previous experience with QDS (RQC)	0.460	0.594	1.585
Use of Local varieties (LV)	1.172	0.215	3.229
Quantity of seeds from another farmer (QOF)	-0.146	0.026**	0.864
Quantity of own saved seeds used (QOS)	-0.065	0.002**	0.937
HH income from agriculture (IA)	0.000	0.032**	1.000
Number of maize varieties grown (VD)	3.808	0.003**	45.073
Ability to define varieties used (AD)	-18.975	0.999	0.000
Previous season maize price (Tsh) (PM)	0.000	0.415	1.000
Constant	-11.877	0.012	0.000

**Significance at P<0.05, *Significance at P<0.1, Initial -2 Log Likelihood = 123.613, -2 Log likelihood after adding predictors = 56.512, Nagelkerke R Square = 0.679, Chi-square=67.101, Model sig Chi square = 0.000, n=120.

membership in associations determines to a certain degree the use of improved technologies since through associations farmers get access to information, inputs, infrastructure, and other supporting services.

Access to credit: Access to credit was an ordinal variable coded 1 for farmers who had ever took agricultural credit and 0 for those who have never taken credit so that higher numeric values are associated with survey respondents who used QDS. The value of Exp (B) was less than 1 (0.064) which implies that accesses to agricultural credits decreased the odds that survey respondents used maize QDS. Farmers who did not have the opportunity to purchase QDS instead they tend to buy other inputs such as fertilizers and certified seeds which they could access in credits. Phiri (2006) reported that, distribution and purchase of quality seeds have rarely backed by appropriate systems or schemes to enable the creation of commercial seed supply networks along more conventional lines.

Access to subsidized seeds: Access to subsidized seeds is an ordinal variable coded 1 for farmers who got subsidized seeds and 0 for those who did not get subsidized seeds so that higher numeric values are associated with survey respondents who obtained subsidized seeds. The value of Exp (B) was greater than 1 (21.46) which implies that accesses to agricultural subsidy increased the odds that survey respondents used maize QDS. Input subsidies especially NAIVS programme have been an important policy instrument for promoting use of improved inputs (Masalawala, 2010). NAIVS has increased farmers experience with quality seeds and more OPV maize varieties nonetheless quantity of seeds provided through NAIVS is limited. In situations thatfarmersneed more maize seeds they find easier for them to purchase and use QDS which in most cases available within their wards or divisions.

Seed exchange between farmers: The value of Exp (B) was less than 1 (0.86) implying that an increase in quantity of seeds exchanged between farmers decreased the odds that survey respondents used maize QDS. Lack of an effective marketing scheme for QDS in rural areas has led to informal seed trade occurring between farmers which in turn affect negatively use of QDS. The finding is comparable to Minot *et al.* (2007) that as farmers rely on exchange of locally saved seeds the chance of using quality seeds decrease.

Use of own saved seeds: The value of Exp (B) was less than 1 (0.94) implying that an increase in quantity of own saved seeds decreased the odds that survey respondents used maize QDS. This finding is similar to previous findings that farmers continue to recycle seed over a long period of time and only occasionally demand new seed from outside to replace their own saved seed in most cases (Olatokun *et al.,* 2010; Graudal and Lilleso, 2007, Minot *et al.,* 2007).

Income from Agricultural Activities: The value of Exp (B) was 1 implying that an increase in household income increased the odds that survey respondents used maize QDS. This finding is similar to Minot (2007) and Kugbei and Shahab (2007) which found that limited income from the sale of agricultural produce limit farmers from purchasing quality seeds.

Number of varieties grown: The value of Exp (B) was greater than 1 (45.06) implying that as number of maize varieties grown by farmer was higher, the odds that survey respondents used maize QDS increased. It was further found that farmers have been growing between three to six varieties. Demand for more improved varieties of maize promotes the purchasing of QDS. However, farmers often do not know or understand varieties as the result farmers keep on growing many varieties in one season (Minot *et al.,* 2007). Farmer's useseveralvarieties as coping strategy for overcoming weather uncertainties something which also makes famers purchase QDS.

Conclusion and recommendations

Conclusion

The quality declared seeds was introduced in Kongwa district by NGO in 1997 but by 2012 there was only one group of producers in the district. From this study, the evidences generated can help in up-scaling QDS commercialization and seed sector development in line with the key lessons from the study that:-

a) Most of seeds (76%) still used by farmers were obtained through informal systems

through rural market systems. The most of quality seeds used came from QDS (21%) and therefore small-scale seed multiplication by smallholder farmers themselvesas they provide seeds at affordable costs, timely accessible and more adopted to the local environment. However, the supply of quality seeds supply persists due to few small-scale producers with limited capacity to supply seeds.

b) Informal seed system (saved maize) continued to be the main source of seeds to smallholder farmers. Farmer's decision to purchase quality declared seeds was negatively affected by local system such as continued seed saving and access to seeds saved by others through exchange in local markets. This is attributed to limited access to quality seeds due low use rural market systems (local shops and auction days) in distribution of quality seeds and mostly sold in input stores located in urban canters.

c) Seed subsidy of 10kg of certified seeds per farmer influenced demand for more quality seeds which resulted indecision to use QDS. Despite QDS were not distributed through subsidy but farmers who accessed certified seeds were influenced to use quality seeds but not satisfied with the quantity of seeds and therefore purchased QDS.

d) Small scale seed business lacks credits back up to facilitate farmers access them. This negatively affected decision to purchase QDS because agricultural credits accessed were onlylinked with certified seeds and other inputs such as fertilizers suppliers.

e) Farmers groups provide opportunities to share information and exploit opportunities collectively such as collective procurement of inputs.

f) The level of income earned by farmers from agricultural activities influence farmers to invest more. As a result, they tend to use inputs of better quality such as QDSfor more income.

Recommendations

The findings suggest that Quality Declared Seeds (QDS) system that complement formal and informal seed system should be enhanced to ensure quality seeds are available and accessed in rural market system. The followings are recommended actions for up-scaling QDS production and development of seed sub-systems:-

a) More public investment in up-scaling commercial Quality Declared Seeds (QDS) production in other areas. The allocation of resources to capacity building of farmers to produce seeds could be more sustainable means at lower costs than input subsidies.

b) Integrating QDS in subsidy as well as credit scheme to enhance more production and access to quality seeds in rural areas.

c) Since rural market systems such as exchange between farmers, local shops and auction days as seasonal input suppliers there is need to strengthen more farmer's groups/associations to take such roles. This includes QDS production and mobilization of collective procurement of inputs as well as marketing of outputs.

d) Improving local varieties mostly used by small scale farmers and integrating them in small scale seed multiplication such as QDS system. This will also serve as commercial strategy for reserving of local varieties which can diminish as farmers adopt copyrighted varieties supplied by large companies.

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