

Research Application Summary

**The impact of extension services on agricultural production: a case of maize in
Ludewa District of Njombe Region, Tanzania**

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Abstract

The agricultural sector is Tanzania's main economic pillar. However, the development of the sector cannot be achieved without transformation of smallholder agriculture, which make up the larger proportion of the sector in the country. Provision of quality agricultural advisory services to enable farms access local, national and international markets is critical. There is a need for a well articulated and comprehensive agricultural extension policy that will enable implementation of an effective extension system. The current study assesses Tanzania's national agricultural extension system to quantify the impact of extension services on production and productivity of maize. Cross sectional data were collected using a structured questionnaire. The production function was estimated using Ordinary Least Square method (OLS). The results indicated positive relationship ($P = 0.001$) between extension services and quantity of maize produced. Other variables which revealed positive and significant relationships with extension services are family size and size of land. Sex of households head and fertilizer application showed negative and significant relationship with extension services. The study concludes that extension is an important factor for agricultural sector productivity. Recommendations to improve the quality and effectiveness of agricultural extension services in Tanzania are provided.

Key words: Agricultural advisory services, fertiliser, household head, women

Résumé

Le secteur agricole est le principal pilier économique en Tanzanie. Cependant, le développement de ce secteur ne peut être réalisé sans une transformation de l'agriculture à petite échelle, qui représente une grande partie du secteur dans le pays. La fourniture des services qualifiés de conseil agricole pour permettre aux exploitants d'avoir accès aux marchés locaux, nationaux et internationaux est essentielle. Une politique de vulgarisation agricole bien articulée et complète est nécessaire pour permettre la mise en place d'un système de vulgarisation efficace. La présente étude a évalué le système national de vulgarisation agricole en Tanzanie, pour quantifier l'impact des services de vulgarisation sur la production et la productivité du maïs. Des données transversales ont été recueillies à l'aide d'un questionnaire structuré. La fonction de production a été estimée à l'aide de la méthode des moindres carrés ordinaires (MCO). Les résultats indiquent une relation positive ($p = 0,001$) entre les services de vulgarisation et la quantité de maïs produite. D'autres variables ayant révélé des relations positives et significatives avec les services

de vulgarisation sont la taille du ménage et la superficie des terres. Le sexe des chefs de ménage et l'application d'engrais ont montré une relation négative et significative avec les services de vulgarisation. L'étude conclut que l'extension est un facteur important pour la productivité du secteur agricole. Des recommandations visant à améliorer la qualité et l'efficacité des services de vulgarisation agricole en Tanzanie ont été faites.

Mots clés: Services de conseil agricole, engrais, chef de ménage, femmes

Introduction

Agriculture in Tanzania directly supports over 33 million people and contributes 60% of the country's GDP, including over 61% of export earnings. Agriculture also provides 84% of rural employment. Recent studies indicate that agricultural output must grow by at least 70% per annum in order to meet the Sustainable Development Goals (SDGs). This is more than double the current 33% production increase (Kapange, 2010). Greater focus needs to be targetted to the agricultural sector, as a key component of Tanzania's growth strategy (Bagarama and Kaiyilla, 2010). Greater use of knowledge by small scale farmers is needed through more effective and client oriented agricultural research and community education.

Other important factors for growing the sector are outlined in the national census of Agriculture report (URT, 2006) as: markets, rural financial services, availability of farm inputs, agricultural research and extension, and social and cultural factors. In particular, this study focuses on the agricultural advisory services as a mechanism to provide effective community education and as an underpinning to the other important components. To define the word extension, this paper adopted the definition by Christoplos (2010) who defined 'extension' as an admittedly amorphous umbrella term for all the different activities that provide the information and advisory services that are needed and demanded by farmers and other actors in agri-food systems and rural development. "Extension" includes technical knowledge and involves facilitation, brokering and coaching of different actors to improve production, postharvest management, market access, dealing with changing patterns of risk and protecting the environment.

The objective of any national agricultural extension programme is to improve farmers' outputs by adopting new or improved farming technologies, practices and methods. Traditionally farming technologies reach the farmers via extension personnel, who have the responsibility to ensure that the desired technology is appreciated and used by farmers. In other words, extension personnel are a bridge between researchers and other knowledge generators and farmers. Historically the flow of information from research to farmers has been ineffective and this has created an information vacuum at the farmer level (Mngumi, 2010). Research results that are to be given to farmers remain redundant somewhere in the system. The inability for information to flow is explained by several factors including, weak links between research, extension and farmers; poorly organized extension and farming systems; inadequate coordination among research institutions and extension workers; weak policy enabling environment and financial constraints that

limit facilitation of extension logistics and plans (Doamekpor, 2005; Mattee, 1994 cited in Mngumi, 2010). The other important factors include poor incentives to extension workers that normally work under harsh environments, inadequate technical and other knowledge among extension workers (Doamekpor, 2005; MLDF, 2010 cited in Mngumi, 2010) and poor resource utilization (NALERP, 2004 cited in Mngumi, 2010). The end effect is either the appropriate technology not reaching the farmers or reaching the farmers in an altered quality which ends up into poor adoption (Mngumi, 2010). Despite the fact that extension is the important factor for sustainable and agricultural productivity little has been done to assess and quantify its impact on crops output. The objective of this study was to assess the situation of extension services and quantify its impact on maize output.

Theoretical framework

Extension services are important in enabling producers obtain 'know how' to realise the increased production and productivity and in accessing information for marketing and the other support services essential for agricultural development towards poverty reduction and overall development. Extension aims at empowering farmers to identify and analyse their agricultural problems and enables the right decisions on matters pertaining to profitable and sustainable agriculture. Therefore, linkages with knowledge and research is of key importance as it creates channels through which relevant research agenda for improving farmer practice is developed, packaged and disseminated to end users (Mvuna, 2010).

On the other hand, sustainability and productivity of agricultural sector worldwide depends on the quality and effectiveness of extension services among other factors (Kimaro *et al.*, 2010). Observations show that in developing countries, there is a gap between agricultural performance and available research information. This has been attributed to poor extension services delivery as well as limited interaction between knowledge generators (researchers) and extension workers. Poor communication between actors in extension services delivery particularly the ministries of agriculture and education and other relevant ministries, research institutions, NGOs, private sector (agribusiness) and farmers have also been shown to hinder flow of knowledge and developed technologies to farming communities. A strong link between extension workers and researchers will improve the quality of disseminated information, as well as, adoption of new technologies by farmers, and consequently lead to increased agricultural production and improved livelihoods of the rural poor.

Methods and Materials

Description of the study area. The study was conducted in Ludewa district which is in the Njombe region (previously Iringa district). Ludewa lies between latitude of Ludewa: -10.113036 and longitude 34.680121. It has a humid (> 0.65 p/pet) climate. Ludewa is bordered by Ruvuma region in the South and East and covers a total area of 6,325 km². It has five divisions, 25 wards, and 77 villages of which eight were chosen for this study. Ludewa district is endowed with generally rich soils and is one of the few districts in Tanzania with good agricultural potential. Ludewa District has a population of 133,218 and average household size of 4.4 persons (according to 2012 census). The big proportion of its land area is not cultivated, hence its natural vegetation is still intact. The landscape

is mostly covered with closed broadleaved deciduous forest. The climate is classified as a humid subtropical (dry winter, hot summer), with a subtropical dry forest biozone. The soil in the area is high in lixisols (lx), soil with clay-enriched lower horizon, low Cation Exchange Capacity (CEC) and high saturation of bases. About 95% of the people live in rural area and depend on agriculture as their main economic activity. Main food crops cultivated include maize, sorghum, wheat, beans, and cassava. Cash crops are coffee, sunflower, tobacco, and pyrethrum. Livestock keeping is not widely practiced but some households rear cattle, goats, sheep and donkeys.

Sampling technique and data collection. Multi-stage sampling technique was used to select the study areas. Ludewa district was purposively selected due to its representativeness in terms of maize production and remoteness. Random sampling technique was used to select 420 respondents from Ludewa and Mawengi wards of Mawengi Division, and Mlangali and Lupanga wards of Mlangali Division. Cross-sectional data were collected using a structured questionnaire. Additional primary data were obtained through key informant interviews using a checklist.

Analytical technique and model specification. As indicated in Peterman *et al.* (2010), the conventional method for measuring and modeling the impact of extension services in agricultural productivity is through the estimation of production functions that model the maximum output produced from the set of inputs given the technology available to the household. The production of a farm manager “*i*” in household “*j*” is given by equation.

$$Y_{ij} = f(V_i, X_i, Z_j), \dots \dots \dots (1)$$

where Y_{ij} is the quantity produced, V_i is a vector of inputs used by farm manager i ; (including land, labor, capital, and extension advice), X_i is a vector of individual attributes, and Z_j is household and community-level variable(s). Therefore, the current study followed the same procedure as in Peterman *et al.* (2010) where the dependent variable is the amount of maize produced (in bags of 100 kg) the extension variable which is the main concern of the study is added as independent variable in production function. The production function is given by equation.

$$Y_i = f(X_i, Z_j), \dots \dots \dots (2)$$

Where Y is the quantity of maize produced, X is a extension variable and Z is a vector of other variables (gender, family size, age of the head of household, size of land owned, fertilizer application). Deriving from the implicit model in equation (2), the empirical model below is estimated using Ordinary Least Square (OLS) method.

$$Y_i = \beta_0 + \beta_1 X + \beta_i Z_i + \epsilon \dots \dots \dots 3$$

Table 1. Expected signs of the effect of independent variables on maize production

Variable	Description	Expected sign
Family size	Total of members of Family	Positive
Sex	Sex of the head of household	Negative/positive
Age	Age of head of household in years	Negative / negative
Size of land	Total acres owned by head of household	Positive
fertilizer	If household applied fertilizer or not	positive
Extension	Number of times household visited by extension officer	positive

Results and Discussions

Results from the descriptive analysis indicated that in the study area the majority of households (87.7%) did not receive any visit from an extension worker during the period of the study (Table 2). On the other hand, a few households (0.2%) were visited over 12 times by the extension workers. The implication here is that provision of extension services in the study area is limited to a few farmers (less than 13%) with an even smaller proportion receiving most of the visits.

Table 2. Extension services provision in Mawang and Mlangali divisions of Ludewa district Tanzania

Number of visits	% of farmers received extension services
0	87.7
1	6.2
2	4.3
3	0.7
4	0.7
5	0.2
12	0.2

The results of the production function analysis are presented in Table 3. Although six independent variables involved were analysed, the extension services variable is the main concern of this study. The results revealed that positive relationship between total output of maize and number of visits by extension workers, family size, and size of land. On the other hand, negative relationships were found between total output and sex, age and application of fertilizer. These negative relationships imply that the more these variables are employed, the less total output of maize will be produced. The inverse relationship between output and age, output and fertilizer application was not expected. Probably the explanation for the inverse relationship between output and age can be that when household become older the decision making in production becomes less effective and hence low production. It may also be a result of reduced availability of labour on the farm. Likewise, the inverse relationship between output and fertilizer application can be caused by poor application of

fertiliser such as excessive application of fertilizer which may lead to toxic and reduced land productivity.

The results indicated that the more the extension officers visits the more the maize output realized (assuming that visits are associated with education, training etc). This implies that extension services can significantly increase crop yields and production. Improving extension services for smallholder farmers is therefore an important means of improving agricultural output.

Table 3. Results for the production function estimated

Variables	Coefficients	t-statistics	Sig.
Family size	1.837	3.21	0.001***
Sex of household head	-5.272	-1.887	0.060**
Age of household age	-0.038	-.463	0.643
Total size of land	1.544	22.671	0.000***
If fertilizer applied	-13.392	-3.560	0.000***
Number of visits by extension officer	5.552	4.404	0.000***
Constant	31.036	4.299	0.000

F-statistic = 103.877***, $R^2 = 0.601$, Adjusted $R^2 = 0.595$, DW = 1.891

Source: Field Survey Data, 2011; Dependent variable: amount of maize produced in 100kg bags. Asterisks ***,**, * indicate significant at 1%, 5% and 10%.

Conclusion and recommendation

The study results reveal the importance of agricultural extension services in raising quality and quantity of maize production. Extension services showed high significant relationship with maize production. The study revealed that majority of farmers did not access extension services and that more needs to be done to support smallholder agriculture in rural Tanzania. Based on these results, it is recommended that greater investment and focus be targetted to improve agriculture extension services in Tanzania. Extension services should be designed to ensure greater access by smallholder farmers through greater innovation, including use of ICT and related services.

Acknowledgements

This study was funded by the Regional Universities Forum for Capacity Building in Agriculture (RUFORUM).

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