

## Research Application Summary

### **Determinants of maize production among small-scale farmers: A case study of Tigania West in Meru county, Kenya**

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#### **Abstract**

Increase in demand for food for the world's bulging population is one concept that needs to be addressed urgently. This high demand puts pressure on farmers to increase production in order to meet this rapidly growing food need. In all food security contemplations, maize stands at the top staple food for the Kenyan population. Against its importance in achieving Kenya's Agenda 2030 on food security, its production keeps sinking posing a threat to the realization of this agenda. There has been especially a notable food deficit in Tigania west in Meru County which has been attributed to the low maize production. The purpose of this study was to analyze factors that are causing the rapid reduction in maize production. The specific objectives of the study were to determine the social economic, cultural, and climatic factors including agricultural extension service delivery influencing maize production in Tigania West. Quantitative data were used to establish the cause of effects collected using structured questionnaires from a sample population of 204 households. The results showed that the major factors that affected maize production in the area were: income, inadequate extension services, type of labour, land sizes and some farmers indicated that they could not afford improved planting seeds due to their low income. Majority of the farmers in the area were not conversant with the agricultural extension services being offered. The efforts of the officers in the agriculture department were also noted to be minimal. It is recommended that the extension department becomes more intentional to reach farmers to improve maize production in the area. The Government should address the lack of incentives for farming communities by improving access to credit and farm inputs. This could be enhanced by employing more extension service providers to disseminate agricultural knowledge to more farmers.

**Keywords:** Agricultural Extension Service delivery, Kenya, Meru County, maize production

#### **Résumé**

L'augmentation de la demande alimentaire pour la population mondiale en plein essor est un concept qui doit être abordé de toute urgence. Cette demande de hausse pousse les agriculteurs à augmenter leur production afin de répondre à ce besoin alimentaire en croissance rapide. Dans toutes les réflexions sur la sécurité alimentaire, le maïs est le principal aliment de base de la population kenyane. Malgré son importance dans la réalisation de l'Agenda 2030 du Kenya sur la sécurité alimentaire, sa production ne cesse de baisser, ce qui constitue une menace pour la réalisation de cet agenda. Il y a eu en particulier un déficit alimentaire notable à Tigania West dans le comté de Meru, qui a été attribué à la faible production de maïs. Le but de cette étude

était d'analyser les facteurs qui causent la réduction rapide de la production de maïs. Les objectifs spécifiques de l'étude étaient de déterminer les facteurs socio-économiques, culturels et climatiques, y compris la prestation de services de vulgarisation agricole, influençant la production de maïs à Tigania West. Des données quantitatives ont été utilisées pour établir la cause des effets recueillis à l'aide de questionnaires structurés auprès d'un échantillon de population de 204 ménages. Les résultats ont montré que les principaux facteurs qui affectaient la production de maïs dans la région étaient : les revenus, les services de vulgarisation inadéquats, le type de main-d'œuvre, la taille des terres et certains agriculteurs ont indiqué qu'ils ne pouvaient pas se permettre de semer des semences améliorées en raison de leurs faibles revenus. La majorité des agriculteurs de la région ne connaissaient pas les services de vulgarisation agricole offerts. Les efforts des agents du département de l'agriculture ont également été jugés minimes. Il est recommandé que le département de vulgarisation devienne plus intentionnel pour atteindre les agriculteurs afin d'améliorer la production de maïs dans la région. Le gouvernement devrait remédier au manque d'incitations pour les communautés agricoles en améliorant l'accès au crédit et aux intrants agricoles. Cela pourrait être amélioré en employant davantage de prestataires de services de vulgarisation pour diffuser les connaissances agricoles à davantage d'agriculteurs.

Mots-clés: Prestation de services de vulgarisation agricole, Kenya, comté de Meru, production de maïs

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## Introduction

Increase in demand for food for the world's bulging population is one concern that needs to be addressed urgently. The population is projected to reach 9.9 billion by 2050 (UN, 2015). This therefore puts pressure on farmers to increase production in order to meet the food demand of the rapidly growing population. The population rise is thought to be more pronounced in Sub-Saharan Africa taking about 93% of the projected population increase (UN, 2015). This is crippling the farmers' efforts on sustainable agricultural productivity. In East Africa, population increase has greatly reduced production per capita by 21% (Pretty *et al.*, 2011). Increased poverty levels, inadequate agricultural production as well as food insecurity are at the frontline of the challenges small holder farmers face. This therefore calls for a concerted actions to combat poverty, increase food production while at the same time keeping the environment safe. According to Alila and Otieno (2006), agriculture performance reduced dramatically after independence from 4.5% to below 2% in the 90s. This decline in performance led to slow growth rate in the country's economy. Such reductions are not helpful to a country whose economy is largely dependant on agriculture contributes 26% of the Gross Domestic Product (GDP) and 65% of its export revenues (KNBS, 2015). The agriculture sector also links with other sectors like transport, service providers, and processors to contribute an additional 27% to the GDP. Yet Kenya is visioned to be a food secure country, offering high employment rates that would reduce poverty levels by 2030. To be a food secure country, agriculture sector needs to be strengthened. The question therefore is, how can this be done?

In Kenya, maize is a priority for ensuring food security and is a key cereal crop grown by about 90% of the rural households (Olwande, 2012). Over the years, there has been a decline in maize productivity posing a threat to food security which is at the center of Kenya's agenda 2030. The increasing population is creating an increasing demand for food which surpasses the annual production. This is causing food insecurity which is against the county's development objective. The overall maize production has declined as observed by Karugia *et al.* (2004). The arable

land is also diminishing due to factors like land degradation through salination of soils and deforestation. Population growth increases land fragmentations, therefore reducing land sizes under agriculture and other. Increasing land under crop production is proving impossible. What options do the Tigania farmers have?

Achieving food security still remains a great challenge to many nations. Food security can be defined as the access to enough food by all people at all the time for a healthy life (Hazell, 2006). It is the adequate supply of food which can be available in form of domestic access or through importation to be able to meet the consumption needs of the total population in the country. At the household level, food security is determined by various factors that are related to the source of income to the family. According to Mrema (2007), food security does not only involve the issue of supply but it is a major function of income and purchasing power. Maize production has been influenced by many factors which are natural and others are social economic factors. The natural factors include climatic condition such as changes in rainfall and soils fertility. Climate has greatly influenced agriculture in Kenya and its impact is well seen. The future impacts of climate change reduction and its impact on economic costs on the market and non-market segments might result in up to 3% Gross Domestic Product per year and this is likely to go higher by 2030 (Mutimba *et al.*, 2010).

Social economic factors that affect maize production include the education level of farmers, the total disposable income, the household income, and cultural issues. The natural factors cause direct effects to the expected yields and are often hard to control. Also, the social economic factors are not obvious and they are hard to clearly define but farmers can be advised on the areas of improvement. The education level can influence the level of adoption of new technology or management practices during the production. The disposable income can be affected by the daily needs of the family thus reducing investment in agriculture. Most of the money that farmers get is mainly spent on educating their children and for consumption needs of their households. This leaves the farmer with small income that can be used on farm inputs and implements.

Maize is among the main cereal crops providing staple food to large number of people in Tigania Sub-County in Meru County, Kenya. Food safety and societal welfare of the population practicing farming greatly depends on maize production. For the subsistence households, maize forms the main source of food. Improved maize production will not only increase food security and lower government expenditure but will also provide opportunities to several unemployed youths and other farmers who do not produce maize by engaging in other maize value chain activities. Kenya has often suffered maize deficit forcing the Government to import maize from other countries to bridge the gap in maize product demand. The study sought to analyze those factors, both cultural and socio-economic, that influenced maize production among smallholder farmers in Tigania West constituency. The information would provide useful information to relevant stakeholders in adapting interventions that would improve maize production.

**Study Area.** Tigania West Constituency in Meru County, Kenya formerly part of Eastern province is located on the Meru-Maua highway. According to Kenya National Bureau of Statistics (2013), the area had a total population of 135,980 covering an area of 455.10 Km<sup>2</sup> (Approx.). The area receives an approximate rainfall amount of 750 mm per annum with an estimated temperature of 23°C (MoALF, 2016). The altitude ranges between 2230-2900 m above sea level in latitude 0.053°N and longitude 37.648°E. The area has five wards Athwana, Akithii, Kianjai, Nkomo, and

Mbeu. Maize production in this area is a key activity though it has faced challenges like high temperatures which has prompted the farmers to start adopting resistant varieties (MoALF, 2016). The area has two crop growing seasons in which they plant maize since it is their main source of livelihood. Due to financial constraints, the research focused on one ward, Nkomo.

**Target population and Sampling.** The households under study were maize farmers who were the head of the families and made decisions concerning their farms. Simple random sampling was used to select 204 households that were surveyed. The following formula was used to arrive at the sample population used (Kothari, 2004):

$$n = \frac{Z^2 * P * Q * N}{d^2(N - 1) + Z^2 * P * Q}$$

Where: n is sample size, N is entire population, Z is coefficient of normal distribution, P is probability of success, Q is probability of failure and D is margin error.

**Data collection.** The data were collected from each household by use of questionnaire, and interviews were done to collect data from agricultural extension officers and local agricultural suppliers. Both the interviews with the local agricultural suppliers and extension officer were to give more insights of maize production issues in the area.

## Results and Discussion

**Socio-economic factors affecting small-scale farmers.** The results in Figure 1 indicate that 66.2% of the respondents were female. This implied that most participants in maize production were females which could mean that women in this community were more engaged in maize production practices. Most of the sample population were above 31 years old. In most cases, the land owners in Tigania were the family heads while the rest used lands which were either given to them by their parents to farm. The high membership in a homestead could signify family labour availability which is essential for subsistence farming. The farmers do not hire much of labour since maize is only produced for subsistence and could use family labour to reduce costs.

A large percentage of farmers did not have formal education. This might have been one of the reasons for low maize production among the farmers since they lacked the necessary skills in production of maize. The study assumed low education to be correlated with low yields as the farmers had no adequate knowledge required to do sufficient farming in the midst of the ever changing environment.

**Cultural factors affecting maize production in Tigania Western constituency.** From Figure 2, the study found that a large percentage of maize farmers did not really rely on their farms to finance their production. Off-farm businesses played an important role as far as investing in maize production was concerned. The farmers depended largely on income sources other than their farms to fund their cultivation and other farming activities. Relying on sources like family and friends could be unreliable and thus affect their farming activities such as purchasing farm inputs. This could be a factor on farmers failing to fully invest and cultivate their fields maize production. Some farmers argued that if the maize farm could not provide them with enough money to sustain the family and continue cultivation, then it did not make economic sense to devote much time in maize production. They thus opted to do subsistence farming for family consumption.

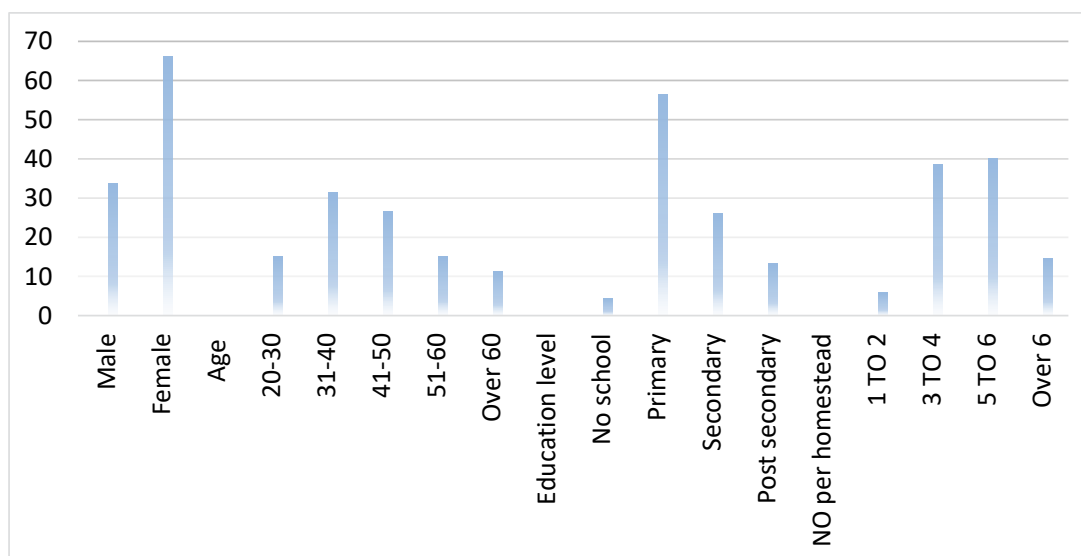


Figure 1. Socio-economic factors affecting maize production in Tigania West

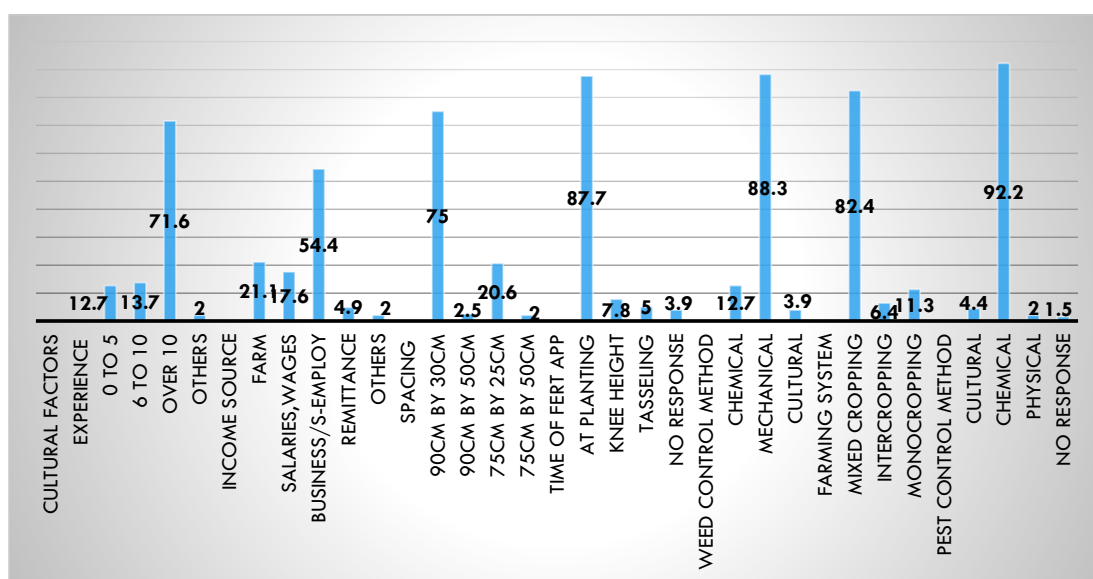


Figure 2. Cultural factors affecting maize production in Tigania West

A larger percentage of the farmers had grown maize for over 10 years. This implied that maize had been grown in this community for a long period and the population depended on it for food and income. Many farmers had experience on maize production and did not depend much on extension services to acquire knowledge on maize farming practices. The over-dependency on traditional means of farming might have contributed to the low productivity in the area. Farmers considered maize farming a normal practice and did not pay much attention to it.

Most farmers were aware of the standard spacing required to farm maize. Thus it could be

concluded that maize spacing was not among the factors contributing to low maize yields in the area. This could be attributed to the trainings they acquire from seed suppliers whenever they buy the inputs.

Most farmers in Tigania west constituency use intensive labour to do maize farming, mainly relying on hiring the local laborers. The overreliance on human labour is prominent in the study area resulting from farmers not having large pieces of land that would make it economical to use machinery.

Farmers argued that they could not afford to purchase more fertilizers for top dressing due to their low income. Fertilizer is an important input in maize production and when applied inappropriately leads to low production. A significant population could not afford to apply fertilizer other than at planting stage. Many relied on organic fertilizers from their farm lands whose supply was also not sufficient. The study therefore concluded that the low maize production in the study area could be as a result of lack of appropriate farm inputs like fertilizer.

Most farmers in the area understand the importance of mixed-cropping. From the farmers' perspective, mixed cropping was beneficial to them as a way of maintaining the eco-balance required in the farm. It also increased production in the farm in terms of multiple harvests and in risk management, i.e., in case one crop failed the other crop could be used to support the farmer. Farmers used crops like beans, and bananas as supplement crops in their production systems.

Pest control was majorly by use of chemicals. This means that farmers have to buy the pesticides for pest management in their crops. Proper pest management would enhance crop production. Farmers explained that they were not aware of the best chemicals to use and the direction of use was not clear to them. The pests that were more problematic to them was the Armyworms. Some farmers used mechanical methods of control such as use of ash to control the pests.

There are two planting seasons in Tigania west constituency and farming is majorly rain fed. In the first season, maize is planted in the month of March and harvesting in July, while in the second season, planting is done in October and harvesting in February.

#### **Influence of agricultural extension services on maize production in Tigania west constituency.**

From the data collected 118 farmers (57.8%) reported that there were no extension services in the area, 86 (42.2%) said there were extension services (Figure 3). The 57.8% of farmers had not interacted with the extension service providers before and from their perspectives, this was one reason for the low production since they were unable to get enough knowledge on the new developments in the farming systems. Clearly farmers need to get more extension services to be able to know the correct farming practices to use. This would enhance increased production from the farms. To the farmers that received these services, it was rarely adequate due to the short contact with the extension workers. From the interview with agricultural extension officers the Government needs to put more effort in funding extension services to enable smooth running of this essential service.

Farmers do not often receive extension services in the constituency. This is attributed to the few numbers of extension officers in the area. For example Nkomo ward had only two extension officers. Thus, it is difficult for the officers to access all the farmers in the area. Farmers are also

made to pay for the transport cost of the extension officer for them to be visited which they found very expensive, and therefore opted not to consult the officers.

Farmers are called upon to attend agricultural training meetings organized by their chiefs. But it was noted that when such meeting are called, only few farmers attend. As a result, they miss important information that they needed to use in their farming operations.

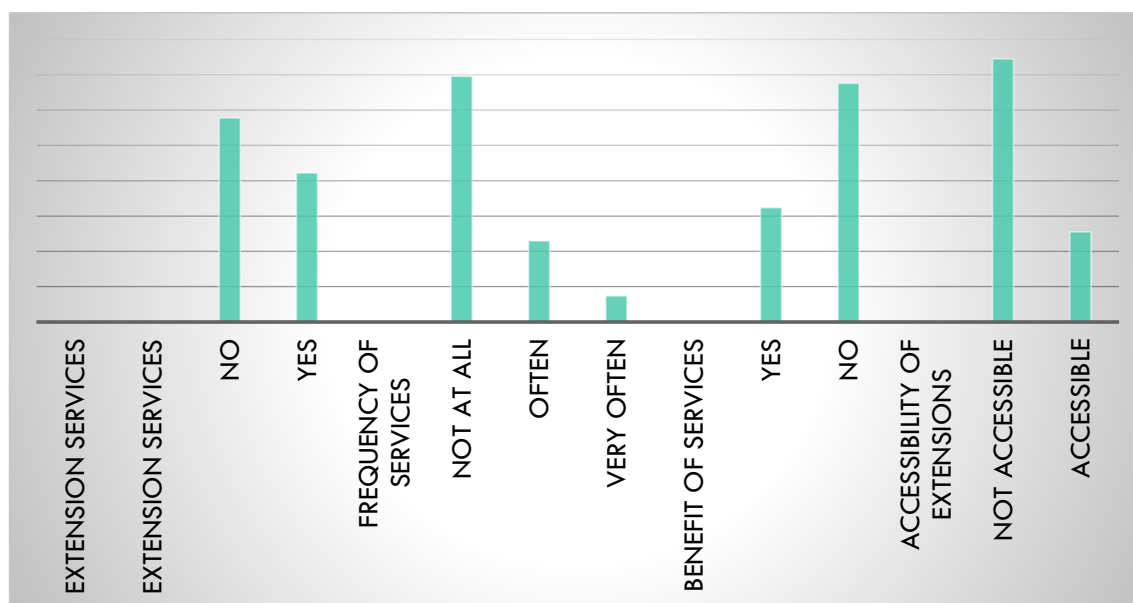


Figure 3. Extension Service Provision in Tigania West

### Conclusion and recommendations

Tigania West maize production has been influenced by several factors, some within the control of the farmers like the choice of farming system, the choice of planting material and factors outside the control of farmers like delivery of the extension service. As shown in this paper, there is little engagement of extension workers in ensuring that agricultural information is disseminated adequately among the farmers. Farmers on the other hand have also been reluctant to pursue these services. Therefore, both parties are called upon to ensure that agricultural knowledge is pursued and adopted in order to improve agriculture in the country. The government also has a role of ensuring that there are enough service providers for the development of the maize sector.

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