

Review on Factor affecting the productivity of maize by Smallholder Farmers in Ethiopia

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Abstract: *Maize farming is largely carried out by small holders in Ethiopia. It is also the single most important crop in terms of both number of farmers engaged in cultivation and crop yield. Ethiopia has doubled its maize productivity and production in 2016, 2017 and 2018. The yield, currently estimated at >3.6 metric tons/ha, at >3.7 metric tons/ha and at >3.2 metric tons/ha respectively in 2016, 2017 and 2018 and also area harvest is estimated at > 2.1 million ha, at >2.1 million and at >2.2 million ha respectively. The main objective of this review is factors that affect productivity in maize production among small holders in Ethiopia then in these review factors like farm size, seed, age, education, and farm experience, number of oxen, off farm activity, communication, road, animal clinic, credit, farmers' cooperative and fertilizers. This implies that a large number of maize productivity farms in the Ethiopia faced inefficiency problems therefore; the government should have to formulate policy and strategy that enhance the way of the farmers managing their farm size, using seed and ways of applying fertilizer to increasing their production and productivity and also it is important to give due attention for farmers education through establishing and strengthening informal education and short term trainings by using the available human and infrastructural facilities like extension agents and Farmers Training Centers (FTCs).*

Keywords: maize, productivity, Ethiopia

Introduction

It is unquestionable that, for every country in the world, agriculture is a crucial sector that accelerates economic growth and development (Enu &Attah-Obeng, 2013).

Worldwide, 475 million farms, constituting 84 percent of a total of 570 million farms, are estimated to be less than 2 hectares (Lowder *et al.*, 2016), and (smallholder) agricultural activities constitute an integral part of livelihoods in rural areas that are home to nearly 70 percent of the population in low-income countries. In Africa specifically, the average share of rural household income stemming from agriculture could be up to 69 percent (Davis *et al.*, 2017)

Maize is the most widely-grown staple food crop in sub-Saharan Africa (SSA) occupying more than 33 million ha each year (FAOSTAT, 2015).

Maize cultivation is largely carried out by small holders in Ethiopia. It is also the single most important crop in terms of both number of farmers engaged in cultivation and crop yield. Hence, in 207/08, maize production was 4.2 million tons, 40 percent higher than tef, 56 percent higher than sorghum, and 75 percent higher than wheat production (Shahidur *et al.*, 2010).

The popularity of maize in Ethiopia is moderately because of its high value as a food crop as well as the growing demand for the Stover as animal fodder and source of fuel for rural families. Approximately 88 % of maize produced in Ethiopia is consumed as food, both as green and dry grain. Maize for industrial use has also supported growing demand. Very little maize is currently used as feed but this too is changing in order to support a rapidly growing urbanization and poultry industry. Unlike its neighbor, Kenya, which imports a significant share for its consumption needs, Ethiopia has increasingly attained self-sufficiency in maize production since early this decade and even exports some quantities to neighboring countries (e.g., Sudan and Djibouti) in years of surplus production. If production can be significantly expanded, the potential for maize export to all the neighboring countries including Kenya is very high although the national demand is expected to continue to grow in the coming years (T. Abate *et al.*, 2015).

As part of developing countries in general and SSA in particular, Ethiopia will never be an exception and predominantly relied on agriculture. According to Tesfaye *et al.*, (2012) Supporting this, MoARD (2010) inferred that majority of the country's total production is produced by smallholder farmers. Besides, Meseret (2012) suggested that, agriculture contributes 90% of the foreign earnings and 70% of the raw materials for industry.

The country has designed and implemented different poverty reduction papers including SDPRP, PASDEP and GTP. Increasing agricultural production, therefore, is vital for ensuring food

security, providing inputs for industrial sector, invigorating export earnings, GDP and then getting better the income and living condition of the people (MoFED, 2010). Despite these policy interventions, due to the insufficient rate of production and productivity, according to Meseret (2012), persistent poverty and poor nutritional status are common. This is due to different production paralyzing factors like absence of new agriculture issues like finance, logistics, storage, transportation and value chains (Asenso Okyere & Samson, 2012); lack of an integrated climate data base (Thomson *et al.*, 2011).

Ethiopia is one such SSA country still suffering from persistent and widespread poverty and food insecurity (Husmann 2016). More importantly, poverty is disproportionately affecting people in the rural areas of the country where agriculture is the main economic activity (Dercon, Hoddinott, and Woldehanna, 2012; Abro, Alemu, and Hanjra, 2014). This calls for the adoption of productivity enhancing technologies and improvement in the efficiency and productivity of the sector as it is becoming no longer possible to increase output by expanding the area under cultivation (Asfaw *et al.* 2012; Headey, Dereje, and Taffesse, 2014). For instance, in Ethiopia, though more than 40 improved varieties of maize have been developed and released over the last four decades (Zeng *et al.*, 2015), the adoption of improved maize varieties is very low (Jaleta, Kassie, and Marenja .2015). It is thus critical to examine the constraints and incentives influencing the adoption of agricultural technologies, and to measure their impact on smallholders' agricultural productivity and wellbeing.

These lessons and insights are drawn from a review of recent literature the process of change and productivity growth in Ethiopian agriculture. Therefore, the general objective of the study was to review factors that affect productivity in maize production among small holders in Ethiopia.

Literature Review

Definition and Concept of productivity

According to Bernolak (1980, p. 03), productivity is the relationship between the quantity of goods and services produced and the quantity of one or all of the resources utilized in turning out these goods and services. It is usually expressed as a ratio. It seems that Bernolak (1980, p. 03) is also in favor of the general definition, which is about the ratio of output and input.

According to Monga (2000, p. 13), productivity is a multidimensional and dynamic concept. Bernolak has projected another view of the productivity (as cited in Monga, 2000, p. 13) that most manager do not know (1) what productivity really means (2) how much vital it is for them

and for their organization (3) that, it can be improved significantly (4) how to measure and analyze it, (5) what factors affect it (6) how to improve it.

Mahoney (1998, p. 18) gives his comments on productivity definition in the following words, productivity is an efficiency concept generally cast as ratio of output to input into some productive process. Mahoney (1998, p. 18) has further explained productivity concept in these words, productivity is also a performance variable and it is perhaps best illustrated in comparison with other performance variables. There were many studies conducted to evaluate productivity by comparison. According to the above-mentioned statement, comparison of performance, efficiency or effectiveness is the best way to illustrate productivity. It seems that the best use of productivity is in its comparison, and for comparison purpose, there should be some criteria with which comparison is done. This may be the previous record, common industry output or any other benchmark available.

Campbell & Campbell (1998b, p. 83) are of the view that efficiency and productivity are interchangeable words. According to them, there is a clear consensus that it is useful to reserve the term productivity for efficiency indices. That is the indicator in question is a ratio of outcomes, measured in some way, to inputs, also measured in some way.

According to Gharneh (1997, p. 01), productivity is a road to competitive enterprises, the economic development of countries and welfare and wellbeing of nations. In this statement, productivity is something else and it is other than ratio. It is a way, method or technique to have more with less.

Wilson (1994, p. 50) has defined productivity more precisely in the following words, productivity is the ratio of outputs produced to the input resources utilized in their production. Typically, productivity is also measured against a base period so as to facilitate trend analysis of the productivity measure.

Maize production in Ethiopia

Ethiopia is one the main maize producer from Africa. Maize is the second most widely cultivated crop in Ethiopia and is grown under diverse agro-ecologies and socioeconomic conditions typically under rain-fed production. Ethiopia has doubled its maize productivity and production in 2016, 2017 and 2018. The yield, currently estimated at >3.6 metric tons/ha, at >3.7 metric tons/ha and at >3.2 metric tons/ha respectively in 2016, 2017 and 2018 and also area harvest is estimated at > 2.1 million ha, at >2.1 million and at >2.2 million ha respectively according to FAO stat 2020 data.

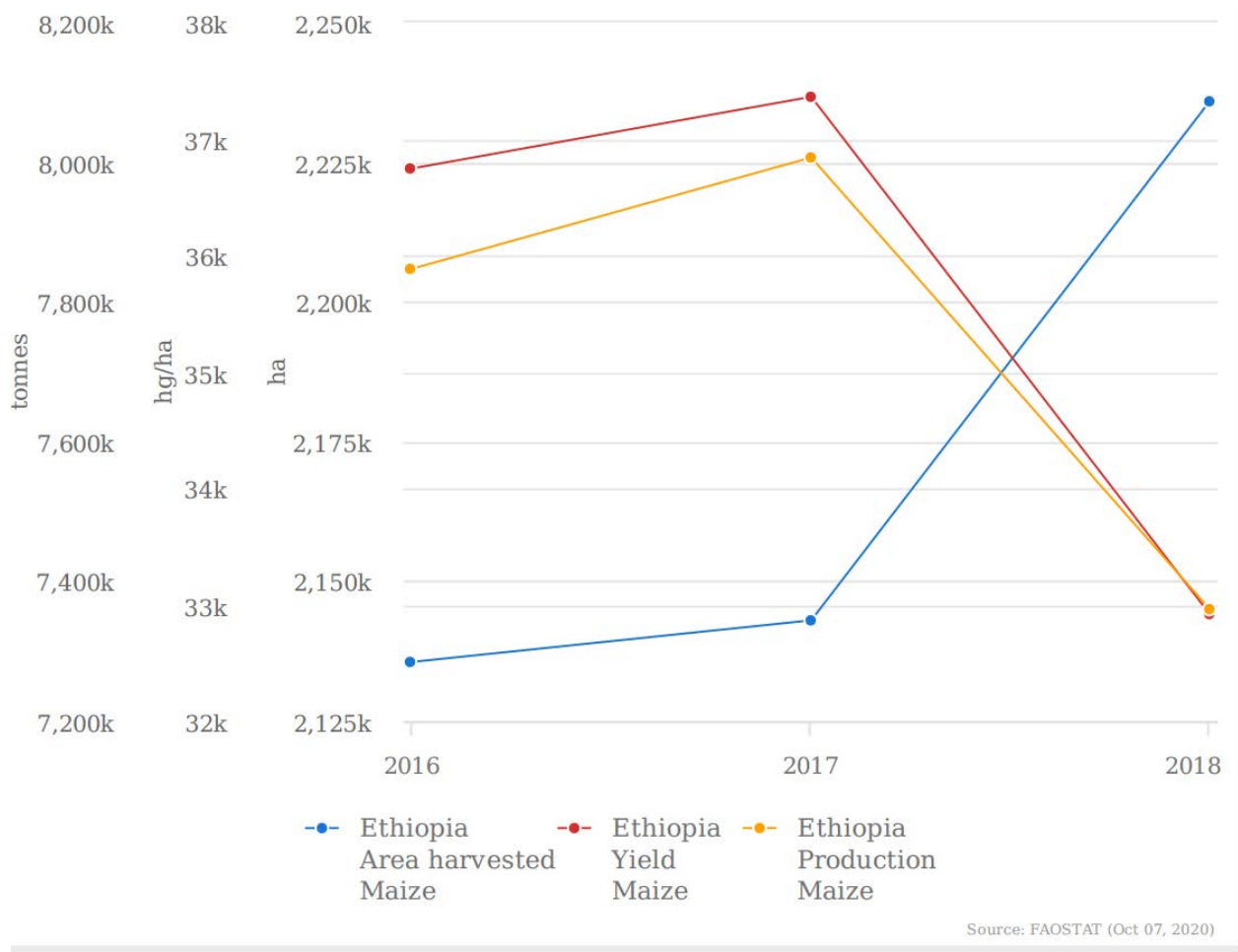


Fig 1: Performance of maize in Ethiopia

Review of factor affecting productivity of maize in Ethiopia

Zalkuwi (2010) identified that older farmers in maize production are more cost efficient than younger ones. However, this is in disagreement with the analyses of Khan and Saeed (2011) which showed that age contributes negatively to efficiencies, meaning that younger farmers were relatively more efficient than older farmers. This is an important finding which notes that younger farmers are comparatively more educated than older farmers. Thus, they inferred from their finding that the younger and educated the farmer, the more technically and economically efficient he is. Similarly, findings of Simonyan *et al.*, (2011) explained that younger farmers were technically efficient than their aged counterparts.

Smallholder farmers mainly depend on family labor; they still hire labor to argument to the family efforts. Farmers with smaller family size are the ones who usually hire labor. Hired labor helps in accelerating production at the various stages of farming. Therefore, it eases the labor

constraint faced by most smallholder farms (Araya Mebrahtu Teka & Sung-Kyu Lee (2019) and Awotide *et al.*, (2015).

According to Araya Mebrahtu Teka & Sung-Kyu Lee (2019) result might raise the question since the landless youth members are considered to be unproductive. In fact, this study finds that landless youth members perform a positive role in shouldering the responsibility of their parents in the rural community. According to Endrias *et al.*, (2013) result farm size is highly significant for positively affecting the technical efficiency of smallholder maize producers. Essa *et al.*, (2011) described that total area cultivated during the long rainy season has a positive and significant effect on technical inefficiency. The results imply that farm size increases technical inefficiency. Perhaps, timely and appropriate agricultural operation on larger land size with traditional technology may not be effective which leads to a higher level of inefficiency. Moreover, larger plot size in the study areas implies larger fragmentation of plots which are widely scattered, making it difficult for farmers to work on all their fields at the same time. Larger plot size may also mean expansion of agricultural lands to marginal areas which makes efficient crop production difficult. As a result, efficiency and productivity can be negatively affected when plot size is large given the current level of technology.

.Adoption of communication technologies, access to roads, animal clinics, and credit and financial institutions positively impacted productivity. Beyond their impact on the economy of society, those variables are critical to strengthening the social, cultural, and customs of the population. Farmers who have mobile phones can quickly get information about the price, supply, and demand for inputs and outputs. They can also get information about weather conditions, the outbreak of diseases, and insects which affect productivity. As a result, farmers can prepare mitigating mechanisms for every possible risk and make momentous and profitable decisions (Ali, Jabeen, & Nikhith (2016) and Araya Mebrahtu Teka & Sung-Kyu Lee (2019)).

Household size plays an important role in maize production and most farmers depend mainly on family labor. However, study results imply that there is a negative relationship between household size and technical efficiency. The reason according to Essa *et al.*, (2011) is that a household with a large family size needs more resource to satisfy its energy and food requirements. Therefore, to meet these needs, resources will be exploited more extensively that leads to expansion to marginal lands leading to environmental degradation, implying a decline in productivity. However, Mignouna (2012) states that the household size has an unclear effect. It is associated with the availability of timely labor and in this case, larger families are likely to be

more efficient. On the other hand, a larger family with more dependents decreases efficiency in farming due to low supply of farming labor. The number of households can significantly contribute to the economic and social development of smallholder farmers (Abate *et al.*, (2015), Musa Hasen Ahmed *et al.*, (2017)).

Education potentially enhances farm efficiency and knowledge with regard to agricultural production. Educated farmers apply better farming methods. They are also better placed to try newer forms of farming (Rebecca, 2011). In addition, Chiona (2011) used education as a proxy for human capital to show that a higher level of education may lead to better management of farming activities. This is because educated farmers are likely to access information easily, and use it to make well informed decisions. However, these findings contradict with some studies by Zalkuwi (2010) which showed that farmers' level of cost efficiency tend to decline with education.

According to Araya Mebrahtu Teka & Sung-Kyu Lee (2019) studies result shows, the amount of labor expected to work on the farm is shifting to participate in other income sources, and farmers do not spend their time and energy on farming at the appropriate time.

Farmers who use certified hybrid seed are expected to have higher efficiency levels (Chiona, 2011). According to Rebecca (2011) most small-scale farmers who practice subsistence farming do not buy certified seeds, but they use recycled seeds that are stored after every harvest, while others buy recycled seeds from their fellow farmers. This practice affects the crop output every year in terms of quantity as well as quality. Hybrid maize seeds play an important role in maize production. Most smallholder maize producers use the same seed they used previously. After harvesting they store some of the maize in order to use it in the next planting season, a practice which hampers the effort of trying to increase productivity. According to Endrias *et al.* (2013) the use of hybrid maize variety positively affected the technical efficiency of smallholder maize producers. Farmers who were users of hybrid maize variety were technically more efficient than non-users.

Araya Mebrahtu Teka & Sung-Kyu Lee (2019) and Zeweld *et al.*,(2015) found evidence for the positive correlation of fertilizer and other farm inputs on productivity, and on helping to transform the agricultural sectors. In this study, our empirical analysis witnessed the positive contribution of the application of chemical fertilizers and pesticides to enhance agricultural output.

According to Endrias et al. (2013) the relationship between oxen holding and technical efficiency in maize production was positive. Thus, oxen availability is crucial to increase technical efficiency in maize production.

Farmers' associations play an important role in organizing members into input cooperatives and in creating access to financial services from state and NGO sectors and seeking access to other financial development agencies. For small-scale farmers it is important to be organized in order to get access to credit which they can use to buy new improved inputs, especially seed to increase technical efficiency. Farmers' organizations play an integral role in maize production and efficiency through dissemination of latest agricultural information to other farmers, and buying seeds in bulk for sharing. Therefore, this may have an impact on smallholder as many become efficient. This means that farmers' organizations influence technical efficiency, and there is a positive relationship between the organization and the technical efficiency of smallholder maize producers (Rebeca (2011), Awotide *et al.*, (2015), Ali *et al.*, (2016) and Araya Mebrahtu Teka & Sung-Kyu Lee (2019).

Conclusion and Recommendation

Conclusions

The main objective dealt with in this review is to factors that affect productivity in maize production among small holders in Ethiopia. It is found that smallholder maize producers small holder farmers are productive in resources used in the production of maize in the county. The productivity show that something else and it is other than ratio, and it is a way, method or technique to have more with less and is the ratio of outputs produced to the input resources utilized in their production. So the identified determinants of productivity maize in this review are farm size, seed, age, education, and farm experience, number of oxen, off farm activity, communication, road, animal clinic, credit, farmers' cooperative and fertilizers.

Recommendations

The consequences of this review give information to policy makers on how to improve the productive and optimal use of resources in production of maize production in Ethiopia. The following recommendations have been drawn based on the review. It is important to give due attention for farmers education through establishing and strengthening informal education and

short term trainings by using the available human and infrastructural facilities like extension agents and Farmers Training Centers (FTCs).

Encouraged and strengthened road accessibility, animal clinic, access to market information and other extension services. Therefore, it implies that cooperatives should have clear and agriculture oriented missions. Moreover, there must be active participation of farmers through giving leadership especially to those marginalized people including women that help member farmers to increase their resource use efficiency.

Policy initiatives that improve or enhance the way of the farmers managing their farm size, using seed and ways of applying fertilizer to increasing their production and productivity.

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