

Sustainability of Maize Production in Kenya

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1. Abstract

Maize is Kenya's principal crop and is wholly dependent on rainfall, while only about 17% of the country is suitable for rainfed crop production. Despite the great efforts made to increase maize production, the demand has occasionally outstripped the supply, requiring importation of large quantities of maize grain. Producing high maize yields on existing cultivated land is the surest way of generating the extra-required maize because there is limited scope for expanding cultivated land.

Traditional farming practices are no longer capable of meeting Kenya's maize production requirements, consequently, widespread application of scientific methods is essential. Foremost, the farming community must know the potential of the land under cultivation and the essential crop husbandry measures necessary to achieve the maximum possible maize yields without compromising the land's productive sustainability.

In the bulk of maize growing areas of Kenya, the yield of maize without fertilisers or manure ranges between 1.1 and 2.5 tha^{-1} . The levels of maize production results from intricate interactions among the availability of water and nutrients, competition of weeds, occurrence of pests and diseases and the actual management practices.

Increasing maize production in Kenya can be approached both at farm and national levels. At the farm level, a number of important measures are necessary: execution of early and better land preparation, timely planting, planting of the most appropriate maize varieties, proper fertilisation, efficient weeding and improved control of pests and diseases while family labour should be used effectively to carry out weeding operations. At the national level, several interventions are essential: enhancing the productivity of fragile, marginal land ecosystems through improving the existing maize varieties to facilitate the expansion of maize production in marginal land areas, breeding germplasm varieties that are acid-tolerant and utilize phosphorus more efficiently, devising techniques to improve rainwater utilization and developing effective residue management practices. Other interventions include: intensification of research to determine the appropriate types and quantities of fertilizers, manures and agricultural lime for different soils and climatic conditions of the country; boosting of agricultural extension services to promote efficient weeding practices particularly by family labour; increasing agricultural credit facilities to enable farmers purchase the necessary inputs, and put in place maize price policies that encourage farmers to increase maize production on a sustainable basis.

The formulation of a strategy to pursue sustainable maize production in Kenya is indispensable mainly because of the scarcity of good agricultural land and rapid population growth. Unfortunately, the majority of farmers will not be able to provide adequate inputs in order to increase the current yields and to sustain higher yields.

2. Introduction

Maize production in Kenya is a highly relevant activity due to its importance as it is a dominant food crop (Mantel & Van Engelen, 1997). It is wholly produced under rainfed conditions. The maize growing areas of the country are located in ecological zones that allow the maize to grow irrespective of limiting temperature and rainfall environments. It is grown in a wide range of soils including Andosols, Vertisols, Phaeozems, Cambisols, Luvisols, Nitisols, Acrisols and Ferralsols (Muchena et al. 1988).

The bulk of the small-scale farmers who do not apply fertilizers or manure obtain yields ranging between 1.1 and 2.5t ha⁻¹. Traditional farming practices are no longer capable of meeting Kenya's maize production requirements, consequently, widespread application of scientific methods is essential. Foremost, the farming community must know the potential of the land under cultivation and the essential crop husbandry measures necessary to achieve the maximum possible maize yields without compromising the land's productive sustainability.

The levels of maize production results from intricate interactions among the availability of water and nutrients, competition of weeds, occurrence of pests and diseases and actual management practices. Despite the great efforts made to increase maize production the demand has occasionally outstripped the supply requiring importation of large quantities of maize grain.

3. Maize Production In Kenya

Total maize production and maize yield per unit area in Kenya has been affected by many different factors. Among the most important are total planted area and productivity. There is limited scope for expanding cultivated land under maize production since unused land is diminishing or is of marginal quality or just unsuitable for maize production (Kenya Soil Survey, 1987, Muchena et al 1988). Producing higher maize yields on existing cultivated land is therefore the surest way of generating the extra maize grain required to feed the nation. To achieve this goal, a number of remedial activities must be put in place.

3.1 Fertilizer applications

To facilitate production of higher maize yields, it is necessary to carry out appropriate research and identify the short-term needs of the crop and long-term needs of the soil. To determine those needs, frequent soil analysis is necessary (Qureshi, 1990). Once the needs are identified, it is possible to use fertilizers in a balanced way (or better ratio) to achieve the highest returns from the expensive inputs.

Loss of fertilizers, input by way of leaching and P-fixation can be reduced in two ways: first through enriching the soil in organic matter which increases the cation exchange capacity and reduces leaching; second through applying fertilizers particularly N and K in split doses rather than a single dose (Taja and Zaag, 1991).

Another beneficial strategy is the use of a combination of fertilizing techniques with green manure fallow plus stable manure, or compost plus modest quantities of chemical fertilizers (Smaling, 1990; Smaling et al, 1992). Crop rotation, based on the inclusion of polyannual legumes, should be included in the management practices as the system maintains soil fertility (Caporali and Onnis, 1992).

3.2 Weed Control

The only solution to the losses due to weeds is better weed management. Good weed management does not only involve timely weeding of individual fields and crops during the critical stages of crop growth, it also involves keeping the whole field clean and ensuring that a minimum of weed seed is allowed to come to maturity. The smallholder farmers have to rely on improved hand tools and occasionally animal-drawn implements because other alternatives such as herbicides and heavy machinery are too expensive (Aggarwal et al. 1992).

3.3 Technology transfer

Major effort must be made to transfer modern technology through education, training and raising the levels of knowledge of the smallholder farmers. More farmers should be involved in the development of new research packages since they usually understand better the possible impacts of new technologies on their farming systems. The center of research action should be on the farmers' farms while the farmers should be important players in research activities. This approach is likely to benefit the farmers more compared to the situation where the researchers concentrate their research in the research station.

3.4 Tillage Operations

Conventional ploughing operations have to be carried out at the appropriate time depending on the environmental conditions of the farm. Tillage operations should be carried out in such a way that sufficient crop residues are left on the land to decompose and maintain organic matter balance unless other forms of manure from outside are added.

3.5 Liming

Soil analysis should be carried out to determine requirements to facilitate the application of optimum quantities and avoid overliming. Another alternative should be the introduction of acid tolerant maize varieties.

3.6 Insect and disease control

Maize protection from the menace of insects and diseases can be achieved through several methods. Where the use of chemicals seems to be the only way of solving an immediate plant protection problem, pesticides should be used within the context of integrated pest control to increase their efficiency and minimize unwanted side effects such as:

- pest resurgence
- pest resistance to pesticides
- destruction of natural enemies, beneficial insects and non-target species persistence
- residual problems and hazards.

To minimize yield reduction due to pests and diseases, it is important to incorporate pest and disease tolerance features as a high objective in maize breeding program. Crop rotation can be practiced to control pests and diseases (Brust and King, 1994).

4. Summary And Conclusions

The formulation of a strategy to pursue sustainable maize production in Kenya is indispensable mainly because of the scarcity of good agricultural land and rapid population growth. Unfortunately,

the majority of farmers will not be able to provide adequate inputs in order to increase the current yields and to sustain higher yields.

Increasing maize production in Kenya can be approached both at farm and national levels. At the farm level, a number of important measures are necessary: execution of early and better land preparation, timely planting, planting of the most appropriate maize varieties, proper fertilization, efficient weeding and improved control of pests and diseases while family labour should be used effectively to carry out weeding operations.

At the national level, several interventions are essential: enhancing the productivity of fragile, marginal land ecosystems through improving the existing maize varieties to facilitate the expansion of maize production in marginal land areas, breeding germplasm varieties that are acid-tolerant and utilize phosphorus more efficiently, devising techniques to improve rainwater utilization and developing effective residue management practices. Other interventions include: intensification of research to determine the appropriate types and quantities of fertilizers, manures and agricultural lime for different soils and climatic conditions of the country; boosting of agricultural extension services to promote efficient weeding practices particularly by family labour; increasing agricultural credit facilities to enable farmers purchase the necessary inputs, and put in place maize price policies that encourage farmers to increase maize production on a sustainable basis.

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