Maize: key challenges

The world is experiencing rising demand for crops such as maize. It has been estimated that global agricultural production will have to increase by 60% or more by 2050. Some projections suggest a particularly high demand for maize over other cereal crops. To meet this increasing demand will require around a 2.4% per year increase in yield.

However, based on current performance, estimates suggest annual global yield increases for maize as low as 1.6%, well below the rate required. This average also conceals significant variations between regions. Whilst maize yield increases in Asia are generally high, in South America they vary between 1.7 and 4%. Variations in maize yield increases are most dramatic in Africa where some countries are facing decreases in annual yields of over 7%. Currently yields in sub-Saharan Africa can be as low as 1.5 tons per hectare, a fifth of what is achieved by the leading maize producers. Projections by the International Food Research Policy Institute (IFRI), using its International Model for Policy Analysis of Agricultural Commodities and Trade (IMPACT), suggest cereal yields in Sub-Saharan Africa may still be less than a third of the highest yields in East Asia by 2020. A recent Foresight Report by the UK government suggests a gap between potential and actual maize yields of over 60% for Sub-Saharan Africa.

It is widely accepted that increasing production needs to be achieved by improving yields rather than clearing more land for cultivation. Even in those areas where all suitable land is not already under cultivation, there is increasing competition for land, water, labour and other resources (e.g. for urbanisation), as well growing concern about the impact of deforestation and land clearance on soil quality and fertility (e.g. due to problems such as erosion, acidification and salinity), climate change and biodiversity.

There is therefore a need to improve yields by making agriculture more efficient, profitable and sustainable, particularly for smallholders in those regions such as sub-Saharan Africa which combine a high reliance on maize for food with low levels of productivity and more vulnerable agricultural systems.

Currently maize cultivation in these countries is held back by a number of problems. One set of challenges relates to abiotic stresses. Most maize cultivation in the developing world is dependent on rainfall. This makes the crop particularly vulnerable to drought and heat. Current estimates suggest that 25% of maize production is threatened by frequent drought. It is widely accepted that these stresses will be become more acute as a result of climate change, resulting in a potential loss of up to 10% in maize production in Africa and Latin America by 2055. Other abiotic stresses include poor/degraded soil quality which is also seen as a significant contributing factor to poor yields.

Maize cultivation is also affected by a range of biotic stresses including:

- Diseases such as downy mildew, rust, leaf blight, maize streak virus (MSV) and more recently, maize lethal necrosis (MLN) which has led to the total loss of maize crops in some parts of Kenya
- Insect pests such as the stem borer which can causes losses of 20-40%

- Other stresses such as the parasitic Striga (witch) weed which has led to losses of 60-90% in some parts of Nigeria

Finally maize cultivation is held back by a lack of resources and training for smallholders. These constraints include lack of access to improved varieties and good quality seed, limited access to often expensive fertilisers and pesticides, poor dissemination of good agricultural practice, the need for affordable, small-scale mechanisation to replace manual labour and significant post-harvest losses due to poor storage, pest attack and spoilage.

Current research initiatives to address these challenges can be found here.

References and further reading

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