Yield Constraints of Grain Sorghum in Eastern Africa

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Grain sorghum yields are very low in eastern Africa as compared to yields in the US and well below the genetic potential. The national mean yields range from 0.6 to 1.5 Mg ha\(^{-1}\) as compared to 4.3 Mg ha\(^{-1}\) in the US (FAOSTAT, 2006). The biotic and abiotic constraints to yield are numerous with a combined effect of much yield loss. In this poster, information on the national and regional importance of the constraints is presented for Ethiopia, Uganda, Kenya, Tanzania, and Mozambique. The information is from The Atlas of Sorghum Production in Five Countries of Eastern Africa (available in .pdf at www.intsormil.org).

The importance of 43 constraints was assessed assuming that a gap of 4.8 Mg ha\(^{-1}\) exists between mean yield potential and actual mean yields. These included 8 diseases, 9 insect pests, 9 related to soil fertility and soil water, and an additional 7 biotic and 7 abiotic constraints. Information on the more important determinates of yield loss is presented in maps using pie charts for each sorghum production area. The diameter of the pie charts varies according to the total yield loss due to that set of constraints.

### Overview of sorghum production constraints

Soil water deficits accounted for approximately 1.5 million Mg yr\(^{-1}\) of loss. The stalk borer complex was found to be the next most important constraint to yield regionally. Total loss of production potential to stalk borer was estimated to be more than 1.1 million Mg yr\(^{-1}\). Nitrogen deficiency was among the top six constraints in all five countries. Striga and other weeds were important; striga was the most important constraint in Kenya, and the second most important in Ethiopia and Uganda. Quelea species, other bird species, shootfly, and phosphorus deficiency each caused more than 0.5 million Mg yr\(^{-1}\) loss in production.

### Diseases

- **Rust**, smut and grain mold were determined to be the most important diseases constraining yield, and were important in all countries. Recognition was as especially important in Mozambique.
- Anthracnose was of high importance in Kenya, Uganda, and lower altitude areas of Ethiopia. Downy mildew was widespread and of moderate importance in all production areas. Ergot and bacterial streak were important in some of the wetter production areas.

### Insect pests

- The stem borer complex was recognized as the most important cause of yield loss among insect pests in all countries. Shootfly was the next important insect pest, especially in Uganda and parts of Kenya. The chaffer grub complex and armworm complex important in most of production areas of Ethiopia. Armworm is currently important in Uganda and Kenya.

- Sorghum seed was of wide importance. The grasshopper/ locust complex was very important lower altitude areas of northeastern Ethiopia.

### Soil fertility constraints and water deficits

- Soil water deficits were of only localized importance.
- Soil water deficits during crop establishment and during grainfill were major constraints in Ethiopia, while mid-season water deficits were of relatively greater concern in Kenya and Uganda.
- Nitrogen deficiency was a major constraint in all 33 sorghum production areas. Phosphorus deficiency was of moderate or high importance in all production areas, and especially in western Kenya. Other soil fertility related constraints were of only localized importance.

### Other abiotic constraints

- Soil crust was important in parts of Ethiopia and Tanzania. Wind damage was a moderate cause of yield loss in parts of Ethiopia, especially in the eastern mid-altitude production area, and in Tanzania. High temperature was a significant constraint in low altitude area of Ethiopia and coastal Kenya. Constraints to root development were locally important in Nyanza Province of Kenya and south western Uganda.

### Other biotic constraints

- Bird damage was a major cause of yield loss, despite much effort to protect crops. Quelea species and striga were very important in all countries except Mozambique.