Do sustainable intensification practices reduce crop damage? Evidence from the maize-based cropping systems in eastern Uganda

Simon Peter Okioro*,1,2, John Ilukor1,3, Claire Ashaba1, Patrick Okello1, Herbert Talwana1, Johnny Mugisha1, Konstantinos Karantininis5

1 Makerere University, P.O. Box 7062, Kampala; 2 Busitema University, Arapai Campus, P.O. Box 203, Soroti; 3 The World Bank – Uganda, P.O. Box 4463, Kampala; 4 Uganda Bureau of Statistics (UBOS), P.O. Box 7186, Kampala; 5 Swedish University of Agricultural Sciences (SLU), P.O. Box 88, SE-23053 Alnarp, Sweden

Introduction

Feeding 9.7 billion people by 20501 in a sustainable manner is challenging under the increasingly difficult social, economic, and environmental conditions 2-3 (Fig.1). Farmers suffer crop losses/damage due to pests and climatic hazards4,5 (Fig. 2).

Drivers of global food security

- Population growth: 1.6 billion people added per year
- Increasing urbanization: 1.5 billion people added per year
- Socioeconomic change: 300 million people added per year
- Weather events: 500 million people affected per year
- Disease outbreaks: 5 million people affected per year

Food demand
- Food production currently inadequate to meet world needs
- Global food demand is increasing faster than food supply

Food supply
- Global food production is increasing
- Fertilizer use is crucial for increasing food production
- Irrigation is necessary for increasing food production

Policy and other factors
- Policies and government intervention are crucial for increasing food production
- Microeconomic and macroeconomic factors are crucial for increasing food production

Materials and Methods

We use primary data collected in 2015 and 2016 from 440 households as part of the Methodological Experiment on Measuring Maize Productivity, Varieties and Soil Fertility (MAPS) in Iganga and Mayuge districts in Eastern Uganda.

Data was collected by Uganda Bureau of Statistics (UBOS), with technical and financial assistance provided by inter-agency partnership led by the World Bank

In each MAPS household, one maize plot, matching the household cultivation status, was selected at random, from all maize plots cultivated by the household, by World Bank Survey Solutions CAPI app for crop cutting and soil sampling.

The fieldwork was organized around three visits to each household, namely postplanting, crop-cutting, and post-harvest.

During the post-planting visit, each household was administered a farm survey tool that collected information on the plot, farm, and household characteristics.

The enumerator visited the randomly selected maize plot; measured its area and saved its boundaries on a Garmin eTrex 30 handheld Global Positioning System (GPS) device; set up one 4x4m and one 2x2m crop cut sub-plot, in accordance with the international best practices, for later harvesting and weighing.

Data on crop damage (number damaged) was collected from each crop-cut plot.

Data was analysed using Stata 15 to generate key descriptive statistics and fitting a multiple linear regression to estimate the factors that influence crop damage.

Results

The results show that on average, 11 percent of the maize yield can be lost during the pre-harvest stage.

Pests accounted for the largest share of pre-harvest crop damage (74 percent). Termites were major pest reported (24 percent), then crop diseases (15 percent).

The results also reveal that the magnitude of crop damage is lower in the plots with high plant density, high nitrogen content, under maize-coffee intercropping, planted with hybrid maize seed, and managed by older people.

Conclusion

The study concludes that promotion of maize-coffee intercropping, enhancement of nitrogen in the soil, and growing of hybrid seeds should be encouraged to reduce crop damage.

The study recommends that the extension system in Uganda should develop a strategy for building the capacity of young farmers and plot managers to manage their plots and adopt sustainable intensification (SI) practices that reduce crop damage, and have the potential to increase yields and moderate climate change.

References

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10 doi:10.4324/9781138638044

Table 1: Factors influencing crop damage in the maize-based cropping systems

<table>
<thead>
<tr>
<th>Dependent variable</th>
<th>Correlation coefficient (r)</th>
<th>Std. Err.</th>
<th>p &gt; z (Sig.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yield</td>
<td>0.11</td>
<td>0.22</td>
<td>0.05</td>
</tr>
<tr>
<td>Pest damage</td>
<td>0.62</td>
<td>0.33</td>
<td>0.01</td>
</tr>
<tr>
<td>Disease damage</td>
<td>0.19</td>
<td>0.11</td>
<td>0.00 **</td>
</tr>
<tr>
<td>Pesticide use</td>
<td>0.31</td>
<td>0.13</td>
<td>0.00 ***</td>
</tr>
<tr>
<td>Recycled seed</td>
<td>0.33</td>
<td>0.15</td>
<td>0.00 ***</td>
</tr>
<tr>
<td>Insecticide use</td>
<td>0.13</td>
<td>0.05</td>
<td>0.00 ***</td>
</tr>
<tr>
<td>Weather conditions</td>
<td>0.19</td>
<td>0.10</td>
<td>0.00 ***</td>
</tr>
</tbody>
</table>

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*Corresponding author: okisimp@gmail.com, Tel: +256-782-363610 (Makerere University, College of Agricultural and Environmental Sciences, CAES), School of Agricultural Sciences (SAS), P.O. Box 7062, Kampala, Uganda