WP3 Technical Brief No. 2 – October 2019

Farmer-led Field Trials - Maize/Millet-Legume Cropping Systems

Deliverable No: **3.1** Technical brief on farmer-led field trials
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Objectives: *To validate the most innovative Sustainable Agricultural Intensification (SAI) technologies by integrating with innovative Extension and Advisory Services (EASs) and Institutional Approaches (IIAs)*

Introduction

There is an urgent need for innovative and integrated approaches to improve food and nutrition security (FNS) for smallholder farmers in Africa in the context of climate change and diminishing natural resources. Legume-based cropping systems could play a significant role in enhancing FNS, contributing to achieve some of the UN sustainable development goals 1, 2, 3, 12, 13, & 15 and sustainable intensifications of African agriculture. In this regard, growing maize/millets with legumes in rotations or intercropping provides multiple benefits such as improved food and nutrition security, environmental sustainability and improved livelihood of smallholder farmers. Through InnovAfrica project (www.innovafrica.eu), crop diversification using intercropping or rotation of maize/millets with legumes are being tested/upscaled in 7 selected agroecological zones in Ethiopia, Malawi, South Africa, and Tanzania. These are farmer-led trials being conducted involving Multi-Actor platform (MAP) members that have been established in each case country.

Methodology/Steps

To achieve the above-mentioned objective, the following methods/steps were applied (Fig. 1):

- Co-developing selection criteria with MAPs (IIAs), local stakeholders to define farmers trial sites and identify priority technologies;
- Co-engaging farmers and stakeholders to test the selected farmer-led technologies (SAI);
- Adjusting CIMMYT field trial protocols to design the layout, treatments (including randomization, control) and monitor selected indicators (Deliverable 1.5: see www.innovafrica.eu);
- Co-sharing of knowledge, farmers' training/field days; and
- Co-assessing scientific merits of tested cropping systems trial

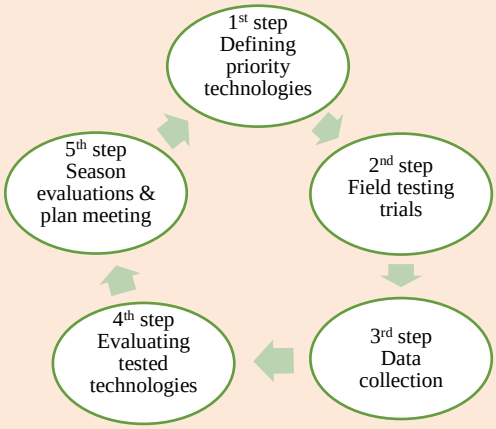


Fig. 1: Annual field activities

Innovations	*Ethiopia*	*Malawi*	*Tanzania*	*South-Africa*
Maize-legume cropping system	× (n = 33)	-	-	• (n = 32)
Diversified Maize/sorghum/millet-legume cropping systems	-	• (n = 70) Mzimba • (n = 72) Dedza	× (n = 60)	-

×: innovations to be tested and •: upscaling the already tested & proven technologies. **n** refers to the total number of farmer fields/plots used for the SAI trials.

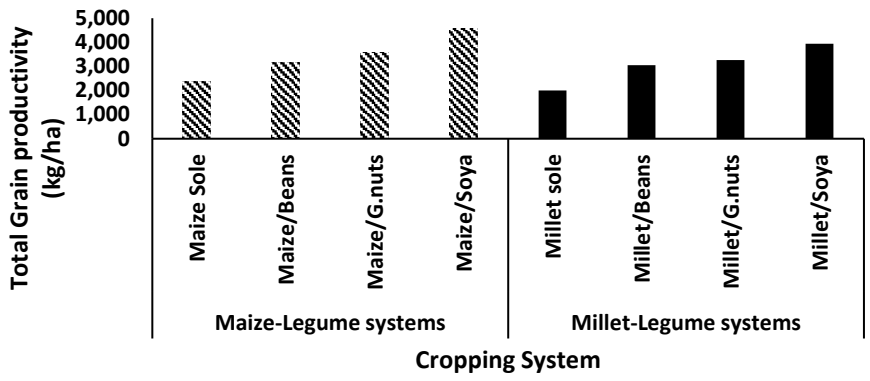
Main findings

a) ***Maize/millet-legume crop yields***

ETHIOPIA

From the first season (2017/2018) trial, intercropping of the maize variety BH 661 with common bean variety Dursitu resulted in the highest grain yields (8392 kg ha^{-1}). The average maize grain yields obtained from all sites (5652 kg ha^{-1}) were much higher than average yield for the zone (2568 kg ha^{-1}). This yield increase was attributed to good agronomic practices including improved varieties, fertilizer

uses and weed control. In general, intercropping of maize with common bean showed significant yield increase, indicating the complementarity of these two crops for intercropping.



MALAWI
Intercropping of maize-legume and millet-legume systems showed higher grain yield than sole cropping (Fig. 2).

Fig. 2: Cropping systems trial in Malawi

SOUTH AFRICA
Yield of beans under intercrop (0.83, 0.71 t/ha) was greater than monocrop (0.76, 0.55 t/ha) in (2017/18 and 2018/19). Intercropped maize (2.0, 2.64 t/ha) performed better than the mono-cropped ones (1.5, 2.33 t/ha) in the 2017/18 and 2018/19 cropping seasons. Land equivalent ratios were >1 with maize–beans intercropping than mono-cropping. This indicates the efficient use of land in intercropping. So far, maize - beans intercropping is the most promising SAI practice.

TANZANIA
Sorghum - legume intercropping with conservation agriculture (CA) practices, fertilizer application, had greater biomass yield (≥6.4 t/ha) than conventional practice (5.3 t/ha). SAI consisting of CA and fertilizers, have the potential to improve yield and soil fertility. Sole groundnut yield ranged from 0.2-0.53 t/ha, cowpea from 0.73-1.07 t/ha, while pigeon pea from 0.7-2.6 t/ha. These yields are all higher than the regional averages (groundnuts - 0.34 t/ha, cowpeas - 0.17 t/ha and pigeon pea - 0.06 t/ha).

b) Food and Nutrition Security: More than 50 percent of the respondents in Ethiopia (n = 25) and Malawi (n = 60) are food secure (Fig. 3).

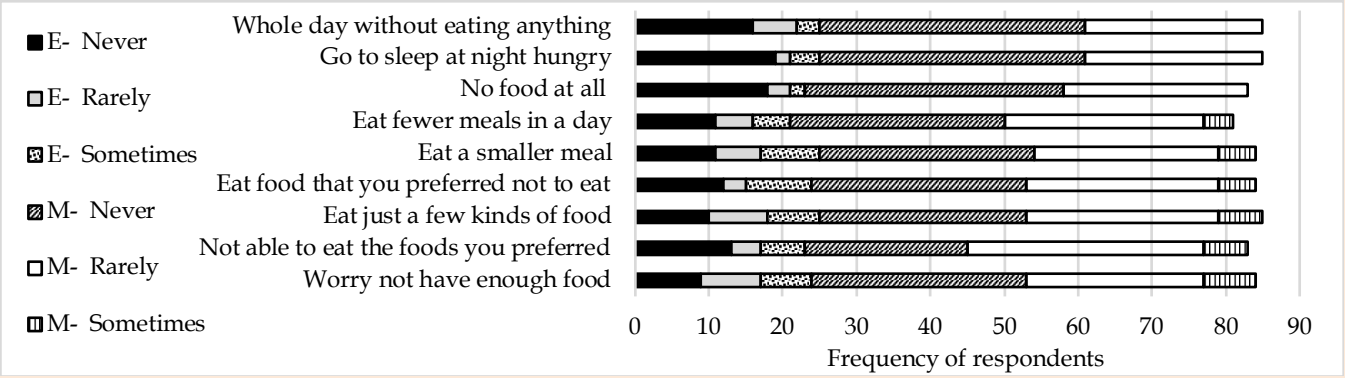


Fig. 3: Response to household FNS by participating farmers in Ethiopia (E) and Malawi (M).

Key Message

- Intercropping of maize-legume and millet-legume systems showed higher grain yield than sole cropping in most of the case study sites.
- Number of farmers reached through EASs with MAPs (e.g. awareness campaigns) on SAI technology, were 2000 in Ethiopia, 30000 in Malawi, 8000 in South-Africa and 236 in Tanzania.
- It is too early to assess effects of SAI technology on ecological, FNS & socioeconomic indicators mentioned in Deliverable 1.5

References & Links

www.inovafrica.eu

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