1ST EASTERN AFRICA AGROECOLOGY CONFERENCE

TRANSFORMING FOOD SYSTEMS FOR RESPONSIBLE PRODUCTION, CONSUMPTION AND SOCIAL WELLBEING

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Strengthening Resilience and Sustainability in Food Systems for Environmental and Socioeconomic Development

Agroecology Research and Advocacy project in Tanzania – Focus on maize production

Gladness Brush Martin & Angelika Hilbeck

INTRODUCTION

Agroecology is the contextualized application of ecological principles to agriculture, and, therefore, the identification and application of the best locally adapted practices is key for its success.

Agroecological farming practices such as soil fertility measure by using compost, manure, mulch or increasing biodiversity through intercropping are rarely systematically implemented by smallholder farmers in Tanzania, with lack of knowledge being a key factor in hindering the widespread adoption of these practices.

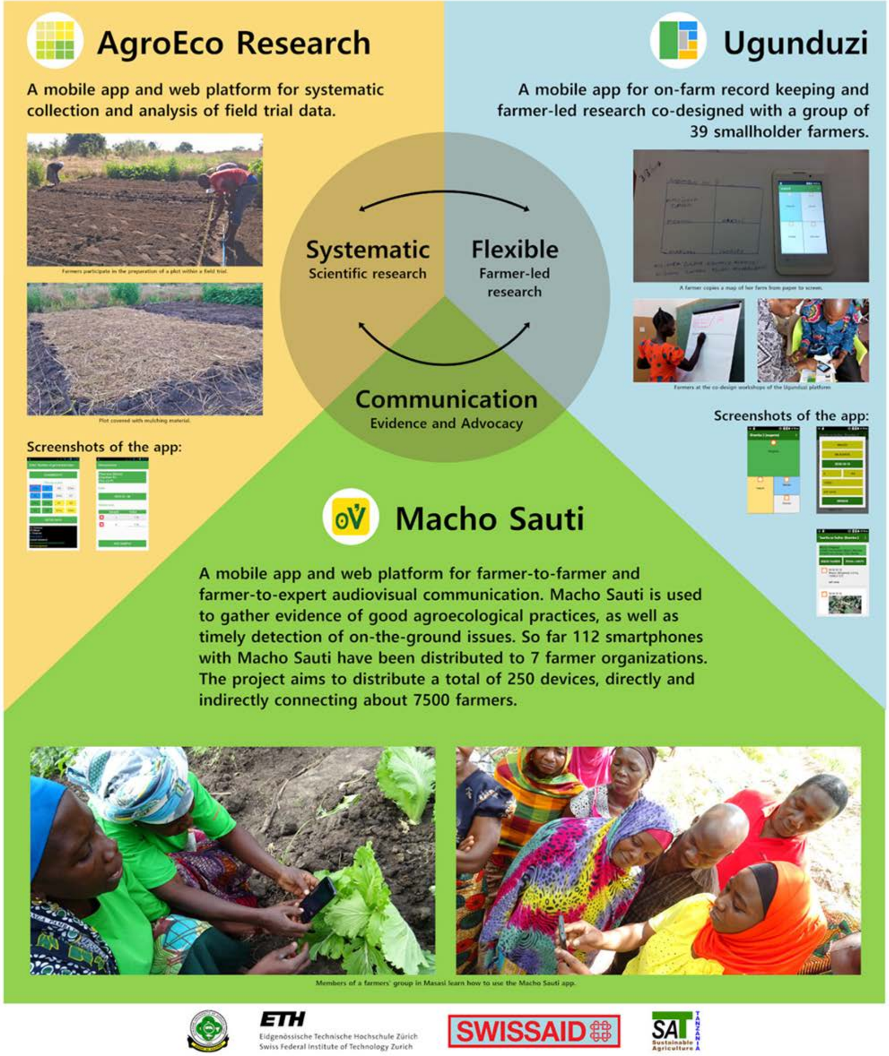
METHODOLOGY

Consists of **two complementary research approaches**:

Scientific research plots were established at three different agroecological zones in Tanzania with different climates. We tested agroecological treatments from three categories of practice: Soil fertility measures, biodiversity, and ecological pest control

In addition and complementation, **farmer-managed satellite experiments** were used to validate the treatments in the farmer's "real world." The methodology is comparable to the Mother and Baby Trial (MBT) method developed by S. Snapp (Snapp 2002).

'Ugunduzi' farmers could choose which treatments they wanted to test on their farms against their usual practice as control.



The research was supported by ICT tools.

Data collection at the research fields made use of a smartphone application developed specifically for this purpose: The **"AgroEco Research** app" tool for systematic data gathering and analysis connected to identical (split plot) field trials set up by scientific researchers

Farmer-led research was supported by a smartphone application called "**Ugunduzi**", which enabled farmers to collect and store data and …

…share their findings with peers on the open-ended communication platform "**Macho Sauti**".

Testing (3 types of) agroecological practices and find the best set of practices for farmers

- Soil fertility treatments (composting and mulching) (**S**)

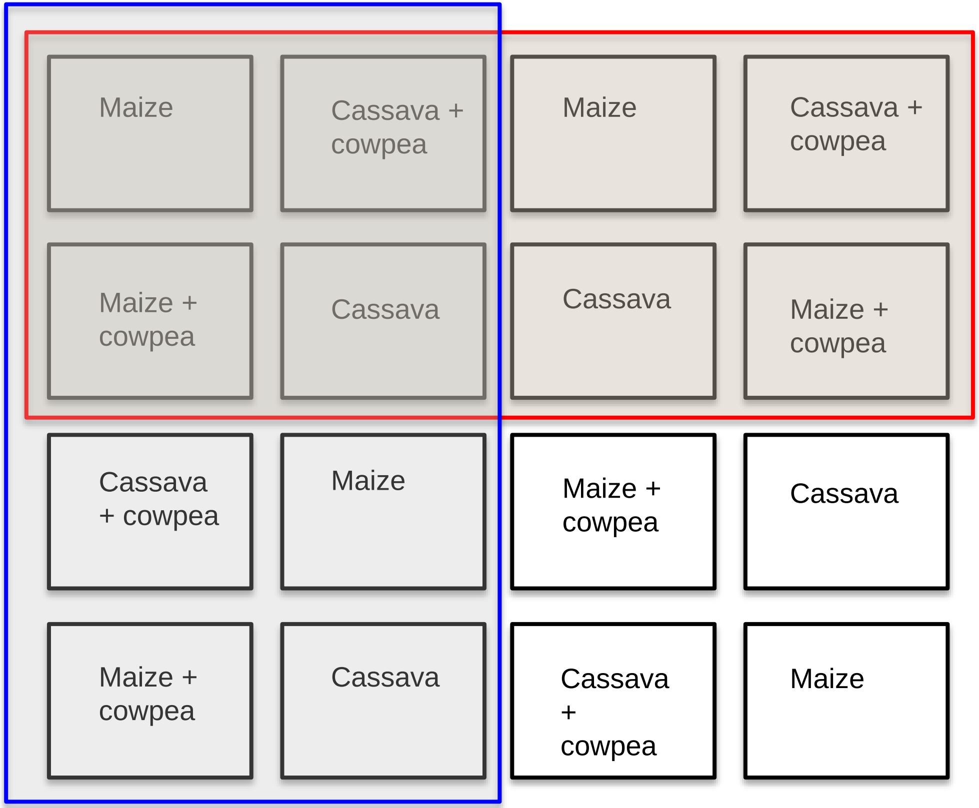
- Increasing biodiversity through Intercropping with legumes (**L**)

- Biological local pest control means (**P**)

Tested alone (S,L,P) and in all combinations (PL,PS,SL,PSL)

Data logging and evaluation using AgroEco Research App

EXPERIMENTAL DESIGN PLAN (Split-plot RCB) of FIELD I – final decision on crops, treatments together with TZ colleagues and farmers



Comparisons:

(Inter)Cropping system I
= Maize w/o cowpea
= Maize with cowpea

(Inter)Cropping system II
= Cassava w/o cowpea
= Cassava with cowpea

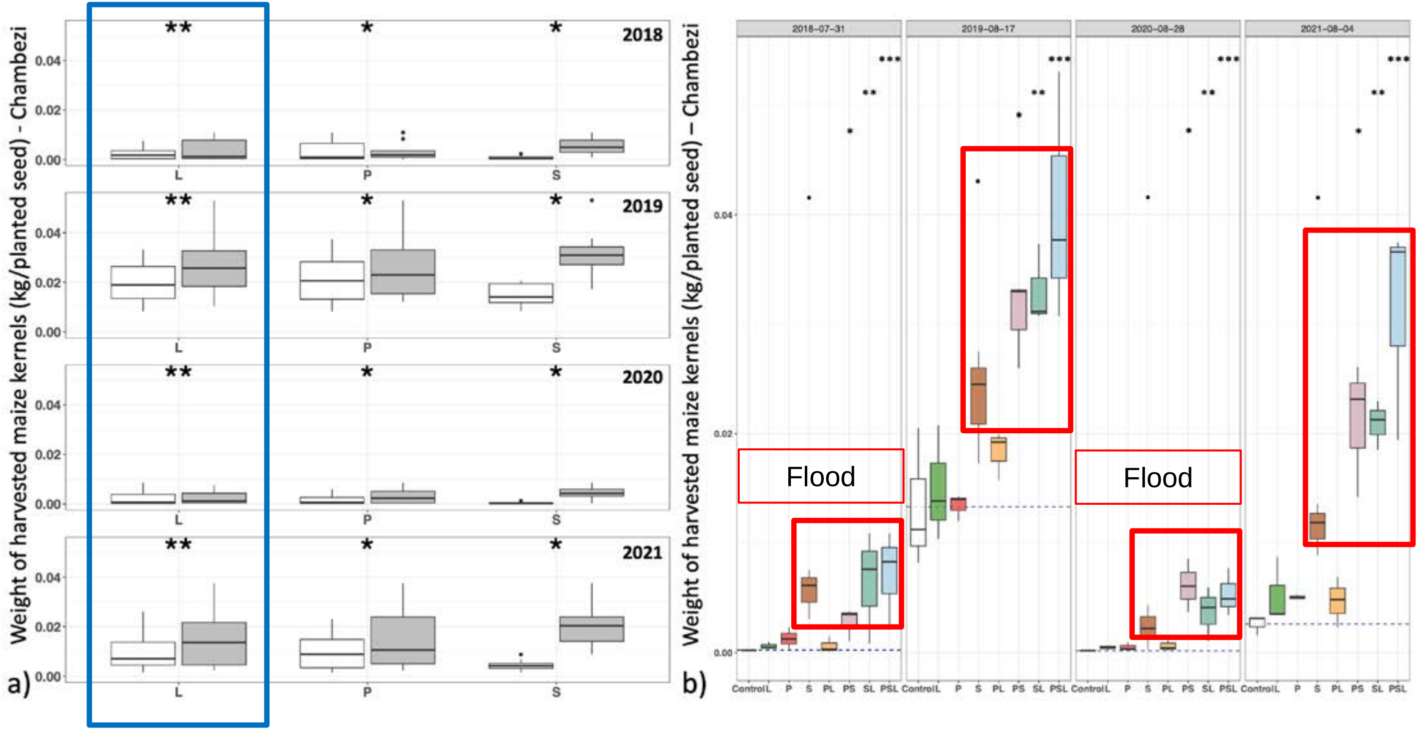
Split plot factors:

- Pest control (yes/no)
- Compost/mulching (yes/no)

Control + 3 single treatments (S,L,P) and 4 combined treatments (PL, PS, SL, PSL)

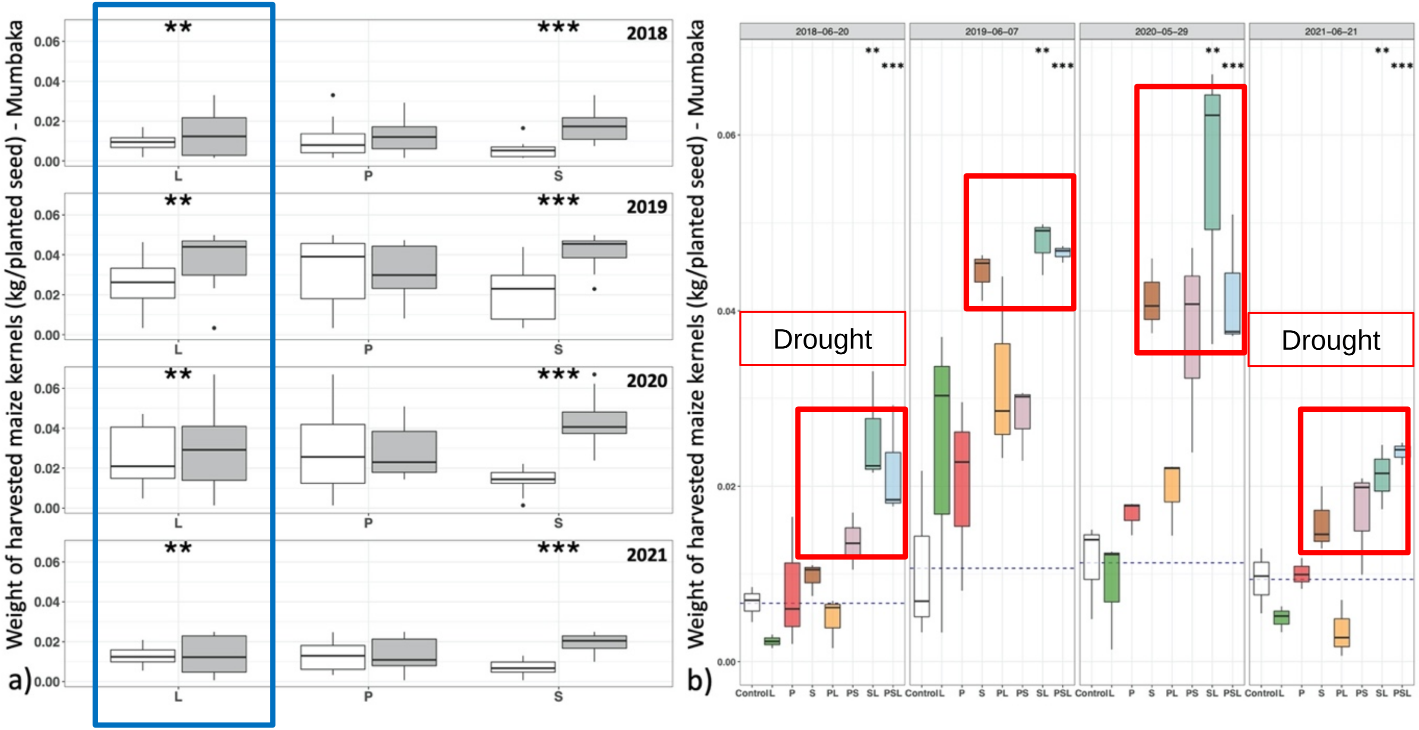
FINDINGS

YIELD: Harvested maize kernels (kg) per planted seed - Chambezi



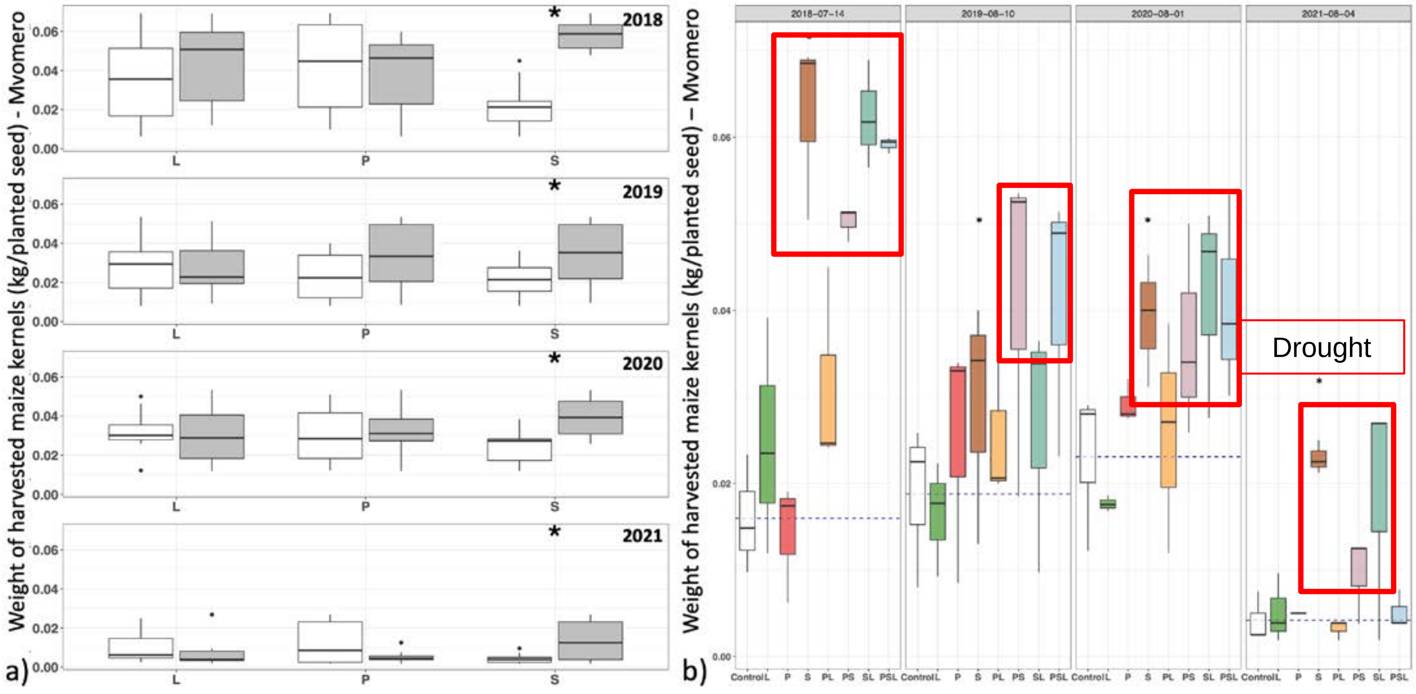
Significantly higher yields on nutrient-poor soils when grown with added soil amendments but delivered highest kernel weights when intercropped with cowpeas on organically amended soil – pattern also in years with environmental challenges

YIELD: Harvested maize kernels (kg) per planted seed - Mumbaka



Similar findings as on Chambezi field station, just a little weaker and also under drought conditions

YIELD: Harvested maize kernels (kg) per planted seed - Mvomero



- Only a positive effects of soil amendments
- No combined effect of legume intercropping nor pest control measures

Treatment effects

Compost & mulching consistently positively affected yields at all field stations - although to varying degrees.

Yields often exceeded 3-4.5 t/ha, with a maximum of up to 7 t/ha indicating the yield potential of the local maize variety used in our trials

Compost & mulching effect was enhanced by cowpea legume intercropping on two stations (i.e. Mumbaka, Chambezi), but less on one (Mvomero). Legume intercropping without soil amendments no effect on maize yields at any station. Organic matter increases phosphorous content which is a pre-condition for activity of symbiontic nitrogen-fixing bacteria in soils.

Likewise, at all stations, pest control hardly exerted a measurable impact, certainly not alone. If a pest control effect was observed it was always in conjunction with other treatments.

Season Effects and environmental stress

All measured parameters varied significantly between seasons due to unpredictable, adverse weather events that occurred at all field stations at different times and in different forms (droughts or floods or both).

Unpredictable weather events have been the predominating impact factor.

Under environmental stress conditions such as floods and drought, highest yield levels per plot were achieved in plots that had received compost & mulch, although at much lower overall levels than in more normal seasons.

Compost & mulching helped to mitigate to some degree adverse weather events such as floods but also dry conditions.

Compost & mulch, for one, added much needed plant nutrients to the soil and the mulch cover also preserved soil moisture but likewise reduced soil erosion in flood situations.

Key messages

- Best return for the effort regarding yields are soil management practices, like mulching, manure or compost. Regardless what the composition of the compost, mulch or the manure, it always increases yields of maize. In fact, without soil fertility practices all other practices don’t really matter with respect to yield.

- Legumes have a more long-term and contextual effect on yield. They only unfolded a measurable significant positive effects when applied on top of soil fertility measures.

- Labor intensive and costly pest control practices delivered little if any benefit – requires knowledge on type and ecology of pests – biggest room for improvements

Knowledge gaps in need of further research

- Interaction effect of compost/manure & mulching with legume intercropping – there is lots of research on either soil fertility inputs or legume intercropping but both is rare
- Finding the best legume crops for intercropping with particular types of non-legume crops (grains, root, oil) – in light of above interactions
- Huge knowledge gaps on pests and proper pest-specific control with organic means. Current advised use of labor intensive and costly pest control practices deliver little if any benefit. What is necessary is knowledge on which pest is targeted and their ecology – biggest room for improvement

Thanks!

ANY QUESTIONS?

You can find me at

- g.brush@swissaidtanzania.org
- angelika.hilbeck@usys.ethz.ch

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