Strengths, Weaknesses and Needed Improvements for On-farm Trials

Peter Setimela et al.

Global Maize Program
Objectives on-farm testing EA & SA

1. Validate performance of new DT varieties under farmer’s conditions
2. Assess farmer trait preferences and gender mainstreaming
3. Accelerate the promotion, deployment and adoption of promising new varieties
Methodology

- **Countries:** Malawi, Mozambique, Zambia, Zimbabwe, Angola, Kenya, Uganda, and Ethiopia, Tanzania
- **Germplasm:** Early to medium and medium to late maturing genotypes
- **Design:** each farmer used as a replicate
- **Plot size:** 8m x 6 rows and spacing decided by the farmers
- **Data 2011-2018**
- **Analysis:** BLUE: The trials were divided into two categories based on yield levels; high-yielding trials (≥3 t ha⁻¹) and low-yielding trials (< 3 t ha⁻¹)
On-farm sites

Map from K. Sonder

Data AVHRR-VHP
Feb 2016

Regional on-farm trials

2015-2016 El Niño

- Exceptional drought
- Extreme drought
- Severe drought
- Moderate drought
- Abnormally dry
Farmers’ Maize variety preference evaluation in the ROFVT
Size of the variance components under the various management

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Early MS</th>
<th>Early RS</th>
<th>Late MS</th>
<th>Late RS</th>
<th>Number</th>
<th>Effective number</th>
<th>Early MS</th>
<th>Early RS</th>
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Variance of a mean 0.225 0.038 0.253 0.039

Standard error of a mean 0.474 0.194 0.503 0.198
Variance components for under various management
On-farm yields under opt & stress

Yield benefits over the checks 25-30 %
Farmer variety preferences

Preference Index for early maturing varieties

Preference index

Male Preference Index  Female Preference Index
Strengths of on-farm trials

• Promotion of farmer preferred varieties
• On-farm data compliments on-station data for variety decisions
• The use of on-farm data for variety release
• Measure the actual genetic gains under farmers conditions.
• Determine decision making such as the LSD size and number of trials.
• Determine the yield gap between on-station and on-farm
• Prediction of yield other for target environments
### Released hybrids tested from on-farm

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<th>Hybrid Code</th>
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Areas of Improvement

- Improve experimental design
- Determine optimal number of entries
- Define optimal LSD threshold
- Optimize the number of locations
- Assess correlation on-farm and on station selection
Areas of Improvement

• Timely provision of seed for both regional on-station and on-farm trials
• Reduce costs through of trials through partnership (NGO, seed companies)
What is the best LSD threshold?

\[ LSD_\alpha = t \frac{\alpha \sqrt{2 MS_{GE}}}{2 \sqrt{2re}} \]
Improve on-farm yield data quality monitoring

**High yielding sites**

- Average grain yield (t) vs. Average Total kernel number \((x10^3)\)
- \(R^2 = 0.6498\)

**Low yielding sites**

- Average grain yield (t) vs. Average Total kernel number \((x10^3)\)
- \(R^2 = 0.5717\)
Environmental data collection

One season (45 trials)
Environmental data collection

Development of a 10-km resolution global soil profile dataset for crop modeling applications

Eunjin Han, Amor V.M. Ines, Jawoo Koo

Keywords: Global Crop Simulation Models, SoilGrids, DSSAT

Abstract: Simulation models at the regional or global scale is the lack of available developed a 10-km resolution global soil profile dataset, at 2 m depth, less km. Several soil physical and chemical properties required by DSSAT 1km. Pedo-transfer functions were used to derive soil hydraulic properties. SoilGrids data were estimated from HarvestChoice HC27 generic soil profile dataset was evaluated in different regions of the globe using insources. In general, we found that the derived soil properties matched well. An ex-ante assessment for maize intensification in Tanzania is provided to uses of the new gridded soil profile dataset.

- On-farm trial targeting
- Understanding yield gaps
Aligning testing sites with Product profiles

Category
- E
- L

Maize Megaenvironments
- Dry Lowland
- Dry Mid-altitude
- Highland
- Wet Lower Mid-altitude
- Wet Lowland
- Wet Upper Mid-altitude
New on-farm variety testing scheme

- Utilize on-farm trial data for variety release and product advancement
- Incomplete block designs
Challenges and the forward

• In some countries, they test new varieties more than 150 locations in a given season

• How to deal with many entries?

• Error variance can be reduced by using right designs

• The use of on-farm data for product advancement and setting breeding priorities

• How best to link with the socio-economics group to collect farmer preferences

• How to incorporate the various farmer management system?
Thank you for your interest!