Taking Maize Agronomy to Scale in Africa (TAMASA)
Planning Meeting, 14-17 March 2016, Arusha, Tanzania

Compiled by Peter Craufurd and Rahel Assefa (CIMMYT)
Executive Summary

The second planning meeting, including a field trip and a partner meeting, was held in Arusha with approximately 45 participants. There was a core TAMASA partner meeting (30 participants) and field trip 14-16 March with participants from Ethiopia, Nigeria and Tanzania, as well as representatives from AfSIS, Leuven, Reading, Wageningen, Michigan and One Acre Fund.

The objectives of the meeting were to: review and present key results from Year 1; review existing and new SOPs for each Workstream (WS); present and approve work plans for each WS & country for Year 2; review any data quality & process/method issues; increase partnerships in Tanzania; identify research opportunities under TAMASA.

The meeting started with an overview of the spatial sampling strategy and how the agronomy, yield and household (HH) data were to be integrated thorough the use of 10 x 10 km sampling cells. Country work plans for Year 2 were then presented along with key questions to be agreed on Standard Operating Procedures (SOPs). Thereafter sessions were held on each Workstream, focusing on the experiences gained in Year 1 and proposals for Year 2. Presentations by One Acre Fund and STARS in WCA were also made, along with three presentations on the TAMASA supported PhD programs. The field trip was to Keratu, about two hours away, where participants visited two of the nutrient omission trials and an Africa Rising fertility trial. The revised Workstreams are given below.

In all three countries 10 x 10 km sampling cells will be the basis of the spatial analysis of the Area of Interest (AOI). All TAMASA implemented activities will be in these cells, i.e. the household, agronomy and yield panel surveys, and the nutrient management and variety tool validation. This is to maximize integration by linking different data streams in the same locations; this also helps increase logistical efficiency. Partners who co-develop and use the tools that are developed will scale these out, predominately but not exclusively in the AOI. Standard SOPs will be used throughout and implemented via ODK to aid rapid data sharing. The more significant changes from 2015 plans were to expand and integrate the household, agronomy and yield panel to about 750 households in each country, and to focus earlier in the tool development process on institutionalisation.

The partner meeting on the 17th included 15 participants from government extension, NGOs, research and the private sector in Tanzania to showcase TAMASA and AfSIS products and to initiate discussions on institutionalisation. Nutrient management attracted the greatest interest among participants.

The layout of the report is arranged by the meeting Agenda.
Key discussion points

Project
- Revised country work plans for 2016 are available from DropBox (https://www.dropbox.com/home/TAMASA/Country%20Workplans%20for%202016)
- Institutionalisation is a key objective and more time and resource needs to be devoted to this process, which has started. The model of all functions being done by country institutions may not be the right one for some products, i.e. a central institute maybe be needed for databases and analytics
- The role of an enlarged household survey that forms the basis of experimentation in future years was discussed and agreed. This is quite a lot of additional work and it was suggested that this should be done through one single visit (for data collection in the upcoming season, with cost-benefit analysis of multiple visits to be assessed for subsequent seasons)
- PhDs still need to be more integrated into the main TAMASA work plan.

Workstream 1
- Overall strategy was agreed by all and cells have been identified in all three countries
- Revisit the question of analyzing representativeness using box plots and other bivariate measures, as well as propensity scores for representativeness in multivariate space (as opposed to AUC)
- Consider whether the selection of cells and farms/HHs should be hypothesis based and not random
- Further develop the UAV SOP using AfSIS, STARS and CIMMYT experience. Need to consider
image processing now and not later. A small group met to discuss these issues further on day 2

- Develop a HH ‘lite’ version for partners to use with yield measurements
- Jordan will provide training in each country on the HH instrument, which has been co-developed with MSU, AfricaRising, and WUR inputs.
- Agronomy instrument should be designed for a single visit and include NDVI or other measures of ‘growth’ where possible

Workstream 2
- Ex-ante spatial framework. In progress; discussion was focused on data gaps and the price modeling

Workstream 3
- Nutrient management. A lot of discussion and a small group met on the question of target yield and treatments for Year 2 on day 2
- Designs and treatments were agreed for validation in Year 2.
- Discussions on institutionalisation have started with BUK in Nigeria and Mlingano in TZ. In Ethiopia institutionalisation is still under discussion with partners but Ethiosis is the logical partner rather than EIAR or MOANR

Workstream 4
- Variety tool experiments are in progress in TZ and planned for ET and NG.
- Discussion of why just phenology and not yield and whether data collection and experiments could be simplified.
- Henri to conduct training in NG and ET on the SOP
- Plans for institutionalisation include IAR in Nigeria, EIAR in Ethiopia and TOSCI in Tanzania

Workstream 5
- Fertilizer formulation. OCP-funded soil sampling in progress in NG.
- Upto four formulations are expected to be tested in Year 2 once soil analysis is completed (in progress)

Workstream 6
- HH survey will be the basis of experimentation in Year 3. A small group met to look at the instrument and process.

Workstream 7
- New project manager Rahel Assefa will assume leadership of several project areas, including communications (including a web-site) and ME&L, as well as budgets and reporting
- For data management the proposed portal (Geonode) and other procedures were discussed. The need to follow the data SOP for uploading and processing ODK-data was re-emphasized.
# Workshop Agenda

## Day 1, Monday, March 14, 2016

<table>
<thead>
<tr>
<th>Time</th>
<th>Session</th>
<th>Topic</th>
<th>Presenter(s)</th>
<th>Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>0800-0830</td>
<td>Registration</td>
<td>C. Mukundi</td>
<td></td>
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<tr>
<td>0830-0900</td>
<td>Welcome &amp; Meeting Objectives</td>
<td>P. Craufurd</td>
<td></td>
<td>30</td>
</tr>
<tr>
<td>0900-1000</td>
<td>Session 1</td>
<td>Overarching sampling strategy &amp; yield data</td>
<td>P. Craufurd, J. Adewopo, J. Chamberlin</td>
<td>60</td>
</tr>
<tr>
<td>1000-1045</td>
<td>Tea/Coffee Break/Photo Session</td>
<td>C. Mukundi (photo)</td>
<td></td>
<td>45</td>
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<tr>
<td>1045-1115</td>
<td>Session 2</td>
<td>Draft Country Workplans</td>
<td></td>
<td></td>
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<tr>
<td>1115-1145</td>
<td>Tanzania</td>
<td>K. Masuki</td>
<td></td>
<td>30</td>
</tr>
<tr>
<td>1145-1215</td>
<td>Nigeria</td>
<td>I. Mohammad</td>
<td></td>
<td>30</td>
</tr>
<tr>
<td>1215-1230</td>
<td>Ethiopia</td>
<td>T. Balemi</td>
<td></td>
<td>30</td>
</tr>
<tr>
<td>1230-1400</td>
<td>Lunch</td>
<td>C. Mukundi</td>
<td></td>
<td>90</td>
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<tr>
<td>1400-1430</td>
<td>Session 3</td>
<td>Nutrient Expert WS3</td>
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<tr>
<td>1430-1510</td>
<td>Innovations in agronomy at scale: lessons from One Acre Fund</td>
<td>D. Guerena</td>
<td></td>
<td>30</td>
</tr>
<tr>
<td>1510-1530</td>
<td>Plans for tool co-development &amp; institutionalisation</td>
<td>S. Zingore, J. Rurinda &amp; J. Andersson</td>
<td></td>
<td>20</td>
</tr>
<tr>
<td>1530-1600</td>
<td>Tea/Coffee Break</td>
<td>C. Mukundi</td>
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<tr>
<td>1600-1620</td>
<td>Session 4</td>
<td>PhD programs WS7</td>
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<tr>
<td>1620-1640</td>
<td>Leuven</td>
<td>J. Diels</td>
<td></td>
<td>20</td>
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<tr>
<td>1640-1700</td>
<td>Wageningen</td>
<td>T. Schut</td>
<td></td>
<td>20</td>
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<tr>
<td>1700-1730</td>
<td>Reading</td>
<td>E. Black</td>
<td></td>
<td>20</td>
</tr>
</tbody>
</table>

## Day 2, Tuesday 15 March

| Time   | Session 5 | Variety tool WS4                                                      |                                     |          |
|--------|-----------|-----------------------------------------------------------------------|                                     |          |
| 0830-0910 | Plans & protocols for calibration | H. Tonnang                                                            |                                     | 40       |
| 0910-0930 | Plans for tool co-development & institutionalisation | H. Tonnang & J. Andersson                                           |                                     | 20       |
| 0930-1000 | Use of UAVS: STARS in WCA | T. Schut                                                             |                                     | 30       |
| 1000-1030 | Tea/Coffee Break | C. Mukundi                                                |                                     | 30       |
| 1030-1100 | Session 6 | Household panel, agronomy & yield survey & ex-ante framework         | J. Chamberlin & M. Jaleta              | 30       |
| 1100-1130 | Household panel & data protocol | J. Chamberlin & M. Jaleta                                           |                                     | 30       |
|         | Yield & agronomy panel & data | P. Craufurd                                                            |                                     | 30       |
## Session 6

<table>
<thead>
<tr>
<th>Time</th>
<th>Activity</th>
<th>Presenter</th>
<th>Duration</th>
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</thead>
<tbody>
<tr>
<td>1130-1200</td>
<td>Ex-Ante Framework</td>
<td>J. Chamberlin</td>
<td>30</td>
</tr>
<tr>
<td>1200-1230</td>
<td>Institutionalization</td>
<td>P. Craufurd &amp; J. Andersson</td>
<td>30</td>
</tr>
<tr>
<td>1230-1400</td>
<td>Lunch</td>
<td>C. Mukundi</td>
<td>90</td>
</tr>
<tr>
<td>1400-1445</td>
<td>Data management</td>
<td>H. Tonnang, J. Adewopo</td>
<td>45</td>
</tr>
<tr>
<td>1445-1530</td>
<td>Project management, communications, M&amp;E</td>
<td>P. Craufurd &amp; R. Assefa</td>
<td>45</td>
</tr>
<tr>
<td>1530-1600</td>
<td>Tea/Coffee Break</td>
<td>C. Mukundi</td>
<td></td>
</tr>
<tr>
<td>1600-1730</td>
<td>Space for workplans, protocols etc.</td>
<td>WS leaders &amp; all</td>
<td>90</td>
</tr>
<tr>
<td>1730-1800</td>
<td>Wrap up &amp; next steps</td>
<td>P. Craufurd</td>
<td>30</td>
</tr>
<tr>
<td>1830-2030</td>
<td>TAMASA Dinner</td>
<td>K. Masuki/ C. Mukundi</td>
<td>120</td>
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</tbody>
</table>

### Day3, Wednesday 16 March

<table>
<thead>
<tr>
<th>Time</th>
<th>Activity</th>
<th>Presenter</th>
</tr>
</thead>
<tbody>
<tr>
<td>0830-1700</td>
<td>Field Trip</td>
<td>K. Masuki</td>
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</tbody>
</table>

### Day 4, Thursday 17 March

<table>
<thead>
<tr>
<th>Time</th>
<th>Activity</th>
<th>Presenter</th>
<th>Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>0830-0900</td>
<td>Registration</td>
<td>C. Mukundi</td>
<td>30</td>
</tr>
<tr>
<td>0900-0930</td>
<td>Introduction &amp; objectives</td>
<td>P. Craufurd &amp; M. Walsh</td>
<td>30</td>
</tr>
<tr>
<td>0930-1015</td>
<td>Brief introduction to products from AfSIS &amp; TAMASA</td>
<td>6 x 5 min (2 slides max)</td>
<td>45</td>
</tr>
<tr>
<td>1015-1100</td>
<td>Tea/Coffee Break &amp; organization next session</td>
<td></td>
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<tr>
<td>1100-1145</td>
<td>World café Round 1</td>
<td></td>
<td>45</td>
</tr>
<tr>
<td>1145-1230</td>
<td>World café Round 2</td>
<td></td>
<td>45</td>
</tr>
<tr>
<td>1230-1300</td>
<td>Feedback from groups</td>
<td></td>
<td>3 mins each</td>
</tr>
<tr>
<td>1300-1400</td>
<td>Lunch &amp; departure</td>
<td></td>
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<tr>
<td>1400-1700</td>
<td>Free for other meetings</td>
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</table>
Overarching sampling strategy & yield data

Gridded sampling strategy & integration yield, agronomy & HH panels

**Workstream 1**

**Aim**

- To capture and understand spatial and temporal variability in soil, climate and agronomic practices and relations with yield (and HH characteristics) in farmers’ maize fields
- To pilot innovative and non-destructive data collection methods that can support agronomy at scale
- To support national agencies collecting yield and other agronomic data with training and awareness of new tools and methods

**Who is responsible for collecting agronomy & yield data?**

**Integration of agronomy, yield, soil & HH data panels**

**Why integrate?**

- Maximise value & efficiency from our & partner activities in Focal Area (& AOI)
- Core data that we collect in all countries & fields; cross-country comparisons
- Contributes to high resolution spatial data on soil, agronomy, yield & HH in Focal Areas

**TAMASA sampling frame**

Country – Maize-based systems – Area of Interest (AOI) – Focal Area (FA)
## Tanzania Workplan

<table>
<thead>
<tr>
<th>RF code</th>
<th>Activity</th>
<th>Milestone/Indicators</th>
<th>Who is responsible?</th>
<th>Where to be done?</th>
<th>When to be done</th>
</tr>
</thead>
<tbody>
<tr>
<td>WS1.1.1</td>
<td>Collect control data from WSL, S &amp; G</td>
<td>Identify 1000 farms by April and 1000 control yield data observations collected in SHZ &amp; NZ by September</td>
<td>Ken, Arnold and Lamack</td>
<td>Southern Highlands zone (1000 farms) and Northern zone (1000 farms)</td>
<td>September 2016</td>
</tr>
<tr>
<td>WS1.1.2</td>
<td>Panel survey</td>
<td>Identify 1000 panel survey farms by April and data collected on the farms by September</td>
<td>Ken, Arnold and Lamack</td>
<td>Southern Highlands zone (500 farms) and Northern zone (500 farms)</td>
<td>September 2016</td>
</tr>
<tr>
<td>WS1.1.3</td>
<td>Descriptive analysis</td>
<td>Report summarizing Year 1 data by December</td>
<td>Ken, Arnold and Lamack</td>
<td>December 2016</td>
<td></td>
</tr>
<tr>
<td>WS1.1.4</td>
<td>Open access database</td>
<td>Baseline yield, soil, NOT and VT data incorporated into database by August</td>
<td>Ken</td>
<td>Baseline yield data (1753), soil data, NOT (290), VT data for 10 sites</td>
<td>August 2016</td>
</tr>
<tr>
<td>WS1.1.5</td>
<td>Training using guides</td>
<td>Metriens conducts a 3 day training in Arusha by May</td>
<td>Ken</td>
<td>Arusha, 3 participants</td>
<td>May 2016</td>
</tr>
<tr>
<td>WS1.1.6</td>
<td>Protocols for processing UAV data developed &amp; training</td>
<td>SOPs developed and users training conducted by June</td>
<td>Peter, Henri, Julius</td>
<td>Arusha, 6 participants</td>
<td>June 2016</td>
</tr>
<tr>
<td>WS1.1.7</td>
<td>B &amp; D UAV flights in selected grids</td>
<td>UAV data processed &amp; added to database by December</td>
<td>Ken</td>
<td>SHZ [l] (1g1b) and NZ [l] (1g1b)</td>
<td>December 2015</td>
</tr>
<tr>
<td>WS1.1.8</td>
<td>Meeting with national agencies collecting yield data</td>
<td>Host institution identified by March</td>
<td>Ken, Jem, Peter, Jairos and Henri</td>
<td>Arusha, 3 institutions identified</td>
<td>March 2016</td>
</tr>
<tr>
<td>WS1.1.9</td>
<td>Roadmap for capacity development and hosting</td>
<td>MOU for support &amp; capacity development signed by May</td>
<td>Ken</td>
<td>May 2016</td>
<td></td>
</tr>
<tr>
<td>WS1.1.10</td>
<td>Training &amp; support for 2016 data collection</td>
<td>Training given; staff for mentoring or MSc identified by August</td>
<td>Ken</td>
<td>August 2016</td>
<td></td>
</tr>
</tbody>
</table>

## RF code | Activity | Milestone/Indicators | Who is responsible? | Where to be done? | When to be done |
<table>
<thead>
<tr>
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</thead>
<tbody>
<tr>
<td>WS3.1.1</td>
<td>Meeting with users for co-development</td>
<td>Partners’ meeting held in Arusha by March</td>
<td>Ken, Peter, Shamie</td>
<td>Arusha; about 57 participants expected</td>
<td>March 2016</td>
</tr>
<tr>
<td>WS3.1.2</td>
<td>Tool(s) developed</td>
<td>Interfaces built by IPN for users by September</td>
<td>Shamie, Jairos, Ken</td>
<td>Nairobi, Arusha</td>
<td>September 2016</td>
</tr>
<tr>
<td>WS3.1.3</td>
<td>NE validation experiments in A0I</td>
<td>390 experiments established in SHZ and some part of NZ by December</td>
<td>Jairos, Ken</td>
<td>Southern Highlands zone (196 trials) and Northern zone (196 trials)</td>
<td>December 2016</td>
</tr>
<tr>
<td>WS3.1.4</td>
<td>NE updated and VL of tool produced</td>
<td></td>
<td></td>
<td>2017</td>
<td></td>
</tr>
<tr>
<td>WS3.1.5</td>
<td>V1 tool evaluated by users</td>
<td>Users evaluation of the NE Tool conducted in SHZ by December 2016 and in NZ by March 2017</td>
<td>Ken, Arnold and Lamack and Jairos</td>
<td>Southern Highlands zone (… users) and Northern zone (… users)</td>
<td>December 2016 (SHZ) and March 2017 (NZ)</td>
</tr>
<tr>
<td>WS3.1.6</td>
<td>Meeting with national agencies to host tool</td>
<td>Partners and users’ meeting held in Arusha by March</td>
<td>Ken, Peter, Jairos</td>
<td>Arusha; about 27 Partners and users</td>
<td>March 2016</td>
</tr>
<tr>
<td>WS3.1.7</td>
<td>Roadmap for capacity development and hosting</td>
<td>MOU for support &amp; capacity development signed by May</td>
<td>Ken</td>
<td>Arusha</td>
<td>May 2016</td>
</tr>
<tr>
<td>WS3.1.8</td>
<td>Training &amp; support for hosting</td>
<td>TRD staff to operate NE tool identified and training by August</td>
<td>Jairos, Ken</td>
<td>Arusha, 6 participants</td>
<td>August 2016</td>
</tr>
<tr>
<td>WS3.1.9</td>
<td>Meeting to raise awareness of Tool</td>
<td>NE Tool awareness raised in a Arusha meeting by March</td>
<td>Peter, Jairos, Ken</td>
<td>Arusha; about 27 Partners and users</td>
<td>March 2016</td>
</tr>
<tr>
<td>RF code</td>
<td>Activity</td>
<td>Milestone/indicators.</td>
<td>Who is responsible?</td>
<td>Where to be done?</td>
<td>When to be done</td>
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<tr>
<td>WS4</td>
<td>Variety options tool available</td>
<td>VT trials conducted and data available by August</td>
<td>Henri, Ken</td>
<td>Southern Highlands zone (5 trials) and Northern zone (5 trials) each with 36 variety entries</td>
<td>August 2016</td>
</tr>
<tr>
<td>1.4.1</td>
<td>Validation of prediction</td>
<td>Validation trials established by December 2016 in SHZ and March 2017 in NZ</td>
<td>Ken, Arnold and Lameck</td>
<td>Southern Highlands zone (trials) and Northern zone (trials) each with variety entries</td>
<td>December 2016 (SHZ) and March 2017 (NZ)</td>
</tr>
<tr>
<td>1.4.2</td>
<td>Evaluate tool design</td>
<td>Users evaluation of the VT conducted in SHZ by December 2016 and in NZ by March 2017</td>
<td>Ken, Arnold and Henri</td>
<td>Southern Highlands zone and Northern zone</td>
<td>December 2016 (SHZ) and March 2017 (NZ)</td>
</tr>
<tr>
<td>1.4.3</td>
<td>Meeting with national agencies to discuss institutionalization of the tool</td>
<td>TOSO staff to operate VT identified and training by August</td>
<td>Ken, Peter, Henri</td>
<td>Arusha; TOSO representative</td>
<td>August 2016</td>
</tr>
<tr>
<td>1.4.4</td>
<td>Meeting to raise awareness of tool</td>
<td>Tool awareness raised in a Arusha meeting by March</td>
<td>Henri, Ken</td>
<td>Arusha; about 57 participants expected</td>
<td>March 2016</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>RF code</th>
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<th>Where to be done?</th>
<th>When to be done</th>
</tr>
</thead>
<tbody>
<tr>
<td>WS5</td>
<td>Evidence of use of impact evaluation results by service providers</td>
<td>1 working paper evaluating the costs and benefits of NC tool recommendations in TZ by November</td>
<td>Jordan, Ken</td>
<td>Addis ababa/Arusha</td>
<td>November 2016</td>
</tr>
<tr>
<td>1.6.1</td>
<td>Findings from impact assessment of tools</td>
<td>1 working paper describing RCT work on packaging innovations and seed spacing in TZ by December</td>
<td>Jordan, Ken</td>
<td>Addis ababa/Arusha</td>
<td>December 2016</td>
</tr>
<tr>
<td>1.6.2</td>
<td>Findings from impact assessment of complementary innovations</td>
<td>2 new MSC students enrolled from UNED enrolled in TZ 2 research papers developed by December</td>
<td>Jordan, Ken</td>
<td>Addis ababa/Arusha</td>
<td>December 2016</td>
</tr>
<tr>
<td>1.7.1</td>
<td>Postgraduate (PhD and MSc) training completed for host country nationals</td>
<td>At least 4 on-demand training from zone and new partners in GIS, GKD and SOPIs in TZ by October</td>
<td>Ken, Arnold and Lampeck</td>
<td>Sokoine University of Agriculture, 1 agronomist and 1 socio-economist, one from each zone (SHZ and NZ)</td>
<td>December 2016</td>
</tr>
<tr>
<td>1.7.2</td>
<td>Technical training of research and extension staff in the use and application of TAAASA tools and SOPIs</td>
<td>At least 4 on-demand training from zone and new partners in GIS, GKD and SOPIs in TZ by October</td>
<td>Ken, Henri, Jordan, Lampeck</td>
<td>SHZ and NZ, two trainings each zone</td>
<td>October 2016</td>
</tr>
<tr>
<td>1.8.1</td>
<td>Timely reporting</td>
<td>Revisions to Narrative and RF by RFS; Annual Reports by November</td>
<td>Ken</td>
<td>Arusha</td>
<td>November 2016</td>
</tr>
<tr>
<td>1.8.2</td>
<td>Annual Planning meetings</td>
<td>Annual planning meeting held in Arusha by March</td>
<td>Ken</td>
<td>Arusha; about 57 participants expected</td>
<td>March 2016</td>
</tr>
<tr>
<td>1.8.3</td>
<td>Annual M&amp;E Report</td>
<td>Conduct country-based M&amp;E quarterly (March, June, September and December)</td>
<td>Ken</td>
<td>Southern Highlands zone and Northern zone</td>
<td>December 2016</td>
</tr>
<tr>
<td>1.8.4</td>
<td>Effective communication</td>
<td>TAAASA and to dis awareness meeting to reach partners &amp; users by March, Six WS- based knowledge sharing products developed in TZ by September</td>
<td>Ken</td>
<td>Southern Highlands zone and Northern zone, at least reach 3 partners in each zone</td>
<td>March 2016 and September 2016</td>
</tr>
<tr>
<td>RFI Code</td>
<td>Activity Description</td>
<td>Estimate</td>
<td>AR</td>
<td>Total</td>
<td></td>
</tr>
<tr>
<td>----------</td>
<td>------------------------------------------------------------------------------------</td>
<td>----------</td>
<td>---</td>
<td>-------</td>
<td></td>
</tr>
<tr>
<td>1.1.1</td>
<td>Collect control data from W31, 3, 4, &amp; 6</td>
<td>3,000</td>
<td>23,936</td>
<td>26,936</td>
<td></td>
</tr>
<tr>
<td>1.1.2</td>
<td>Panel survey</td>
<td>7,500</td>
<td>22,936</td>
<td>30,436</td>
<td></td>
</tr>
<tr>
<td>1.1.3</td>
<td>Descriptive analysis</td>
<td>9,000</td>
<td>18,936</td>
<td>27,936</td>
<td></td>
</tr>
<tr>
<td>1.1.4</td>
<td>Open Access Database</td>
<td>6,000</td>
<td>12,936</td>
<td>18,936</td>
<td></td>
</tr>
<tr>
<td>1.1.5</td>
<td>Training in using Ebner</td>
<td>9,000</td>
<td>18,936</td>
<td>27,936</td>
<td></td>
</tr>
<tr>
<td>1.1.6</td>
<td>Protocols for processing UAV data developed &amp; training</td>
<td>12,000</td>
<td>30,936</td>
<td>42,936</td>
<td></td>
</tr>
<tr>
<td>1.1.7</td>
<td>3-5 UAV flights in selected grids</td>
<td>7,500</td>
<td>22,936</td>
<td>30,436</td>
<td></td>
</tr>
<tr>
<td>1.2.1</td>
<td>Meeting with national agencies collecting yield data</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.2.2</td>
<td>Roadmap for capacity development and hosting</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.2.3</td>
<td>Training &amp; support for 2015 data collection</td>
<td></td>
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</tr>
<tr>
<td>1.2.4</td>
<td>Meeting with users for co-development</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>1.2.5</td>
<td>Tool(s) developed</td>
<td></td>
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<td></td>
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<tr>
<td>1.2.6</td>
<td>NE validation experiments in AOD</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.2.7</td>
<td>NE update, and V1 of tool produced</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.3.1</td>
<td>V1 tool evaluated by users</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.3.2</td>
<td>Roadmap for capacity development and hosting</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.3.3</td>
<td>Training &amp; support for hosting</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.3.4</td>
<td>Meeting to raise awareness of Tool</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.3.5</td>
<td>Tool co-development (V0 + model; V1 + desktop software Viz &amp; R)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.3.6</td>
<td>Validation of prediction</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.3.7</td>
<td>Evaluate tool design</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.3.8</td>
<td>Meeting with national agencies to discuss institutionalization of the tool</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.4.1</td>
<td>Meeting to raise awareness of tool</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.4.2</td>
<td>Capital mapping</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.5.1</td>
<td>Technical training of research and extension staff in the use and application of TAMAS tools and SOFs</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.5.2</td>
<td>Timely reporting</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.6.1</td>
<td>Annual Planning meetings</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.6.2</td>
<td>Effective communication</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.6.3</td>
<td>Annual M&amp;E Report</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Nigeria Workplan

Achievements in 2015
1. Establishment of good partnerships with stakeholders for the co-development of maize enhancement tools:
   - fertilizer recommendations tool,
   - variety tool, and
   - fertilizer blending tool for industry
2. Capacity development of project support staff
   - Training in Data collection with GPS and ODK for proper conduct of field surveys and trials
3. Building partnership for geospatial and weather data acquisition with ICRAE, NASRDA, NIMET.
4. Ninety-five NUTs were conducted across Kaduna, Kano and Katsina States in Nigeria.
5. Panel and baseline surveys conducted
6. Data Management – Repositories created data management TAMASA to serve the three focal countries.
7. Training in KUT, Lusaka, Belgium
   - Ph.D. candidates from the Bayero University, Kano
   - One candidate from ABU, Zaria

2016 UPDATE
1. Data Management
   - Baseline data comprising farmer and field characteristics, maize grain yield records and soil information captured using ODK were uploaded on to the TAMASA server.
   - Panel survey data also uploaded on to the TAMASA server.

Challenges
- Late onset of rains in the 2015 season
- Late training on ODK
- Accessing farmers during baseline survey
- Some panel survey farmers harvested their fields before the harvest stage data collection
- Access to existing data from Partners
- The window to measure yield was short, some point farms are harvested before survey teams located them
- Access to weather data
- Sending completed baseline ODK forms to the server

2. Soil and Tissue Samples Analysis
   - NOT soil samples have been analyzed
   - Leaf samples analysis at advanced stage of completion
   - NOT grain and Stover samples; grinding has been completed, to be delivered to Ibadan for analysis

3. Building synergy with national systems on data collection
   - NAERLS has agreed to partner with TAMASA in the quality data collection.
   - It requires training on use of ODK, soil sampling, etc.
### Workstream 1: Reduced knowledge gap on spatial and temporal variation in agronomy and productivity

<table>
<thead>
<tr>
<th>Activity</th>
<th>Milestones</th>
<th>Who is responsible?</th>
<th>Location of activities, numbers of trails or farmers, etc.</th>
<th>When will activity be done &amp;/or completed?</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.1.1 Collate control data from WS 1, 3, 4 &amp; 6</td>
<td>Baseline: 500 geo-referenced agronomic data, NOT: Data for validation of NE: Data for calibration of VT, from the FAs</td>
<td>IITA/BUK</td>
<td>ADE: Kano (NOT 30, VT 2 trials), Kaduna (NOT 40, VT 2), Katsina (NOT 30), Data of Val. Of VT in Adanri’s work</td>
<td>June - December</td>
</tr>
<tr>
<td>1.1.2 Panel survey</td>
<td>100 farms surveyed and yield and soil data collected</td>
<td>BUK/IITA</td>
<td>ADE: Kano (201), Kaduna (401), Katsina (401);</td>
<td>May - December</td>
</tr>
<tr>
<td>1.1.3 Descriptive analysis</td>
<td>To understand the trend of response</td>
<td>BUK/IITA</td>
<td>BUK</td>
<td>December, 2016</td>
</tr>
</tbody>
</table>

---

### Workstream 1: Reduced knowledge gap on spatial and temporal variation in agronomy and productivity

<table>
<thead>
<tr>
<th>Activity</th>
<th>Milestones</th>
<th>Who is responsible?</th>
<th>Location of activities, numbers of trails or farmers, etc.</th>
<th>When will activity be done &amp;/or completed?</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.1.5 Open access database</td>
<td>A central database of soil and yield, calibration and validation trials made available.</td>
<td>IITA/BUK</td>
<td>IITA</td>
<td>Throughout the year</td>
</tr>
<tr>
<td>Training in using Ebees</td>
<td>Some IITA/BUK staff trained in operating ebees for data collection</td>
<td>IITA</td>
<td>IITA</td>
<td>April</td>
</tr>
</tbody>
</table>
**Workstream 1: Reduced knowledge gap on spatial and temporal variation in agronomy and productivity**

<table>
<thead>
<tr>
<th>Activity</th>
<th>Milestones</th>
<th>Who is responsible?</th>
<th>Location of activities, numbers of trails or farmers, etc.</th>
<th>When will activity be done &amp;/or completed?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Protocols for processing UAV data developed &amp; training</td>
<td>SOPs developed for data collection process</td>
<td>ITA, Julius</td>
<td>ITA</td>
<td>April - June</td>
</tr>
<tr>
<td>3.5 UAV flights in selected grids</td>
<td>High resolution data obtained using UAV.</td>
<td>ITA/BUK</td>
<td>AOI</td>
<td>June - July</td>
</tr>
<tr>
<td>1.1.1 Meeting with national agencies for collecting yield data</td>
<td>Signing of agreements with partners (NAERSI) on data collection and training on improved practices done.</td>
<td>ITA</td>
<td>ITA</td>
<td>March - June</td>
</tr>
</tbody>
</table>

**Workstream 1: Reduced knowledge gap on spatial and temporal variation in agronomy and productivity**

<table>
<thead>
<tr>
<th>Activity</th>
<th>Milestones</th>
<th>Who is responsible?</th>
<th>Location of activities, numbers of trails or farmers, etc.</th>
<th>When will activity be done &amp;/or completed?</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.1.7 Roadmap for capacity development and hosting</td>
<td>Comprehensive plan for national partners to host tools available</td>
<td>ITA/BUK</td>
<td>ITA</td>
<td>April - May</td>
</tr>
<tr>
<td>1.1.8 Training &amp; support for 2016 data collection</td>
<td>Quality data collection by EA and Technical staff</td>
<td>ITA/BUK</td>
<td>BUJK</td>
<td>March - June</td>
</tr>
</tbody>
</table>
### Workstream 2: Use of spatial ex-ante analysis to guide investments

<table>
<thead>
<tr>
<th>Activity</th>
<th>Milestones</th>
<th>Who is responsible?</th>
<th>Location of activities, numbers of trails or farmers, etc.</th>
<th>When will activity be done &amp;/or completed?</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.2.1. Spatialising CUE-ITS</td>
<td>Core algorithm components coded; input data prepared</td>
<td>Jordan/IPNI</td>
<td>IITA</td>
<td>?</td>
</tr>
<tr>
<td>1.2.2. Spatial price modelling</td>
<td>Price data assembled; surfaces generated and validated</td>
<td>Jordan/IPNI</td>
<td>AOI</td>
<td>?</td>
</tr>
<tr>
<td>1.2.3. Yield mapping</td>
<td>Georeferenced yield data assembled; surfaces generated and validated</td>
<td>Jordan/IPNI</td>
<td>?</td>
<td>?</td>
</tr>
</tbody>
</table>

### Workstream 3: Nutrient management tool available

<table>
<thead>
<tr>
<th>Activity</th>
<th>Milestones</th>
<th>Who is responsible?</th>
<th>Location of activities, numbers of trails or farmers, etc.</th>
<th>When will activity be done &amp;/or completed?</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.3.1. Meeting with users for co-development</td>
<td>users will be well carried along</td>
<td>IITA/IPNI</td>
<td>IITA</td>
<td>March - May</td>
</tr>
<tr>
<td>Tool developed</td>
<td>NFT tools available for users</td>
<td>IITA/IPNI/IPNI/ADPs/NOTORE/DORIO/SG2000/NAERLS/IAR</td>
<td>IITA</td>
<td>Feb - Sept</td>
</tr>
<tr>
<td>1.3.2. NFT validation exists in AOI</td>
<td>NFT gives higher yields than FTP in at least 75% of the cases.</td>
<td>IITA/IPNI</td>
<td>AOI</td>
<td>May - December</td>
</tr>
<tr>
<td>Collection of feedback on NFT from users</td>
<td>Feedback collected from users</td>
<td>IPNL-IITA-BUK</td>
<td>AOI</td>
<td>November - December</td>
</tr>
</tbody>
</table>
## Workstream 3: Nutrient management tool available

<table>
<thead>
<tr>
<th>Activity</th>
<th>Milestones</th>
<th>Who is responsible?</th>
<th>Location of activities, numbers of trails or farmers, etc.</th>
<th>When will activity be done &amp;/or completed?</th>
</tr>
</thead>
<tbody>
<tr>
<td>NE updated and V2 of tool produced</td>
<td>field testing of NE recommendation and feedback from stakeholders</td>
<td>IPNI</td>
<td>IPNI</td>
<td>December</td>
</tr>
<tr>
<td>L3.3 V1 tool evaluated by users</td>
<td>NE V1 validated.</td>
<td>IPNI, BUK, IITA and other partners</td>
<td>ADI</td>
<td>December</td>
</tr>
<tr>
<td>L3.4 Meeting with national agencies to host tool</td>
<td>Potential host identified</td>
<td>IITA</td>
<td>IITA</td>
<td>March - May</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Activity</th>
<th>Milestones</th>
<th>Who is responsible?</th>
<th>Location of activities, numbers of trails or farmers, etc.</th>
<th>When will activity be done &amp;/or completed?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Roadmap for capacity dev't and hosting</td>
<td>Capacity of national partners to host tools enhanced</td>
<td>IITA</td>
<td>IITA</td>
<td>March - July</td>
</tr>
<tr>
<td>Training &amp; support for hosting</td>
<td>Building the capacity of host institute</td>
<td>IITA/IPNI</td>
<td>IITA</td>
<td>March - August</td>
</tr>
<tr>
<td>L3.5 Meeting to raise awareness of tool</td>
<td>Tool Scaled out</td>
<td>IITA/IPNI</td>
<td>IITA</td>
<td>Feb - May</td>
</tr>
</tbody>
</table>
Workstream 4: Variety tool available

<table>
<thead>
<tr>
<th>Activity</th>
<th>Milestones</th>
<th>Who is responsible?</th>
<th>Location of activities, numbers of trails or farmers, etc.</th>
<th>When will activity be done &amp;/or completed?</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.4.1 Tool co-development (VOI)</td>
<td>VO of the tool developed</td>
<td>Henri</td>
<td>IITA</td>
<td>March – July</td>
</tr>
<tr>
<td>1.4.2 Calibration of Variety tool</td>
<td>Calibration trials established in some locations within the AOI</td>
<td>BUK and IITA</td>
<td>AOI</td>
<td>March – June</td>
</tr>
<tr>
<td>1.4.3 Evaluate tool design</td>
<td>VT VI evaluated</td>
<td>Partners, IITA, BUK, IAR</td>
<td>AOI</td>
<td>July – November</td>
</tr>
<tr>
<td>1.4.4 Institutionalization tool</td>
<td>Stakeholders meeting with potential host institutions in June; hosting &amp; capacity dev't agreements signed by Sept., 2016.</td>
<td>IITA, BUK, Henri</td>
<td>IAR or IITA</td>
<td>August – December</td>
</tr>
</tbody>
</table>

4. NE Training Workshop, IITA Kano, Nigeria
# Ethiopia Workplan

<table>
<thead>
<tr>
<th>Activities</th>
<th>Activity duration</th>
<th>Milestones</th>
<th>Responsible persons</th>
<th>Locations</th>
<th>Completion period</th>
<th>budget</th>
</tr>
</thead>
<tbody>
<tr>
<td>WS1</td>
<td>Reduced knowledge gap on spatial and temporal variation in agronomy and productivity</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.1.1 Collate control yield data from WS1, 3, 5 &amp; 6</td>
<td>May-Nov. 2016</td>
<td>1000 farmers field in focal areas will be identified by June, 2016 and georeferenced control yield data will be collected</td>
<td>EIAR: Gebreyes and other EIAR staff, CIMMYT: Tesfaye &amp; Mesfin</td>
<td>Imma, Bako, Melkassa and Bahirdar areas</td>
<td>Will be completed in November/December, 2016</td>
<td>Plan to merge</td>
</tr>
<tr>
<td>1.1.2 Panel survey</td>
<td>May-Nov. 2016</td>
<td>1000 panel survey farms in focal areas identified by June, 2016 and socio economic &amp; control yield data will be collected</td>
<td>EIAR: Gebreyes and other EIAR staff, CIMMYT: Tesfaye Jordan, Moti &amp; Mesfin</td>
<td>Imma, Bako, Melkassa and Bahirdar areas</td>
<td>Nov/Dec., 2016</td>
<td>50,000</td>
</tr>
<tr>
<td>WS1 cont’d</td>
<td>Reduced knowledge gap on spatial and temporal variation in agronomy and productivity</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.1.3 Descriptive analysis</td>
<td>Dec. 2016 &amp; beyond</td>
<td>Data cleaned and descriptive analysis of collected data done and figures generated and report written by Jan/Feb, 2017</td>
<td>Tesfaye, Jordan, Moti, Mesfin and Gebreyes</td>
<td>desk top work</td>
<td>Feb., 2017</td>
<td>1,000</td>
</tr>
<tr>
<td>1.1.4 Open access database</td>
<td>Dec. 2016 &amp; Beyond</td>
<td>Yield and soil data base from Surveys, validation experiments made available from Nov./Dec. 2016 onwards</td>
<td>Henri &amp; Julius</td>
<td>desk top work</td>
<td>December, 2016-February, 2017</td>
<td>No budget required</td>
</tr>
<tr>
<td>1.1.6 (a) Meeting with national agencies collecting yield data</td>
<td>August, 2016</td>
<td></td>
<td>Country project coordinator</td>
<td>Respective EIAR and CSA offices</td>
<td>August, 2016</td>
<td>6,000</td>
</tr>
<tr>
<td>WS1 cont’d</td>
<td>Reduced knowledge gap on spatial and temporal variation in agronomy and productivity</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.1.6 (b) Roadmap for capacity dev’t and hosting</td>
<td>August, 2016</td>
<td>Agreement and all facilitation work for capacity development for data collection met by Sept., 2016</td>
<td>Country project coordinator</td>
<td>at CSA and EIAR head quarter offices</td>
<td>August, 20</td>
<td>No budget</td>
</tr>
<tr>
<td>1.1.6 (c) Training &amp; support for 2016 data collection</td>
<td>Sept., 2016</td>
<td>EIAR and CSA staff trained on quality yield data collection at regional level</td>
<td>Country project coordinator, Mesfin</td>
<td>At each CSA regional offices and EIAR head office</td>
<td>Sept., 2016</td>
<td>10,000</td>
</tr>
</tbody>
</table>
### WS2 Use of spatial ex-ante analysis to guide investments

<table>
<thead>
<tr>
<th>Activities</th>
<th>Activity duration</th>
<th>Milestones</th>
<th>Responsible persons</th>
<th>Locations</th>
<th>Completion period</th>
<th>budget</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.2.1 Spatialising QUEFTS</td>
<td></td>
<td>Model written in R that takes gridded input and output for QUEFTS/NE model</td>
<td>Jordan</td>
<td>Addis Ababa (desktop), 1 model</td>
<td>Jun-16</td>
<td>No budget req.</td>
</tr>
<tr>
<td><strong>1.2.2 Spatial price modelling</strong></td>
<td></td>
<td>Set of gridded price surfaces for fertilizer, labor and maize grain</td>
<td>Jordan</td>
<td>Addis Ababa (desktop), 3 surfaces</td>
<td>Sep-16</td>
<td>&quot;</td>
</tr>
<tr>
<td><strong>1.2.3 Yield mapping</strong></td>
<td></td>
<td>Set of gridded estimates of actual yield levels</td>
<td>Jordan</td>
<td>Addis Ababa (desktop), 1 surface</td>
<td>Dec-16</td>
<td>&quot;</td>
</tr>
<tr>
<td><strong>1.2.4 Scenario analysis: targeting of technologies</strong></td>
<td></td>
<td>Report summarizing, analysis of NE tool targeting</td>
<td>Jordan</td>
<td>Addis Ababa (desktop), 1 report</td>
<td>Dec-16</td>
<td>No budget req.</td>
</tr>
<tr>
<td><strong>1.2.5 Scenario analysis: ex-ante impact of investments</strong></td>
<td></td>
<td>Report summarizing, analysis of NE tool impacts</td>
<td>Jordan</td>
<td>Addis Ababa (desktop), 1 report</td>
<td>Dec-16</td>
<td>&quot;</td>
</tr>
</tbody>
</table>

### WS3 Nutrient management tool available

<table>
<thead>
<tr>
<th>Activities</th>
<th>Activity duration</th>
<th>Milestones</th>
<th>Responsible persons</th>
<th>Locations</th>
<th>Completion period</th>
<th>budget</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>1.3.1 Tool(s) developed</strong> March, 2016</td>
<td></td>
<td>V1 version of Nutrient Expert tools developed and Variety tool calibrated</td>
<td>IPNI</td>
<td>Nairobi</td>
<td>April, 2016</td>
<td>?</td>
</tr>
<tr>
<td><strong>1.3.2 NE validation expts in AOI (50 trials)</strong> April, Nov., 2016</td>
<td></td>
<td>50 NE validation experiments established in four FA</td>
<td>EIAR: Gebreyes and other EIAR staff, CIMMYT: Tesfaye &amp; Moslin</td>
<td>Bako and Jimma areas</td>
<td>Nov., 2016</td>
<td>25,000</td>
</tr>
<tr>
<td><strong>1.3.3 V1 NE evaluated by users</strong> August, 2016</td>
<td></td>
<td>Validation experiments evaluated</td>
<td>EIAR: Gebreyes and other EIAR staff, CIMMYT: Tesfaye &amp; Moslin</td>
<td>Bako, Jimma areas</td>
<td>August, 2016</td>
<td>5,000 (?)</td>
</tr>
<tr>
<td><strong>Calibration of NE in new FA + in selected Previous farms</strong> April, Nov., 2016</td>
<td></td>
<td>NE tool calibrated for new FA + previous data confirmed</td>
<td>EIAR: Gebreyes and other EIAR staff, CIMMYT: Tesfaye &amp; Moslin</td>
<td>Melkasa areas + Bako, Jimma</td>
<td>Nov/Dec 2016</td>
<td>25,000</td>
</tr>
<tr>
<td>Activities</td>
<td>Activity duration</td>
<td>Milestones</td>
<td>Responsible persons</td>
<td>Locations</td>
<td>Completion period</td>
<td>budget</td>
</tr>
<tr>
<td>------------</td>
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<td>--------</td>
</tr>
<tr>
<td><strong>WS3 cont’d</strong></td>
<td></td>
<td>Nutrient management tool available</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.3.4 (a) Meeting with national agencies to host tool</td>
<td>March, 2016</td>
<td>meeting organized with national partners to host the tool</td>
<td>Country Project coordinator</td>
<td>Addis Ababa</td>
<td>March, 2016</td>
<td>7,000</td>
</tr>
<tr>
<td>1.3.4 (b) Roadmap for capacity dev’t and hosting</td>
<td>July, 2016</td>
<td>MoU signed between CIMMYT &amp; EIAR ATA (?)</td>
<td>Country project coordinator, IPNI, ATA, EIAR</td>
<td>Addis Ababa</td>
<td>July, 2016</td>
<td>No budget req.</td>
</tr>
<tr>
<td>1.3.4 (c) Training &amp; support for hosting NE tool</td>
<td>Dec., 2016</td>
<td>EIAR &amp; ATA staff trained on NE tool</td>
<td>Country project coordinator, IPNI, EIAR, ATA (?)</td>
<td>Addis Ababa</td>
<td>Dec., 2016</td>
<td>5,000</td>
</tr>
<tr>
<td>1.3.5 Meeting to raise awareness of Tool</td>
<td>March, 2016</td>
<td>Awareness creation meeting organized for users</td>
<td>Country project coordinator</td>
<td>Addis Ababa</td>
<td>March, 2016</td>
<td>see above budget for institutionalization</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Activities</th>
<th>Activity duration</th>
<th>Milestones</th>
<th>Responsible persons</th>
<th>Locations</th>
<th>Completion period</th>
<th>budget</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>WS4</strong></td>
<td></td>
<td>Variety tool available</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.4.1 Tool re-development (V0)</td>
<td>Feb., 2016</td>
<td>V0 of the tool developed</td>
<td>Henri</td>
<td>Desktop/Nairobi</td>
<td>March, 2016</td>
<td>?</td>
</tr>
<tr>
<td>1.4.2 Calibration of Variety tool</td>
<td>May-Nov., 2016</td>
<td>Calibration experiments established in each of the three focal areas</td>
<td>ELAR: Gebreyes and other ELAR staff</td>
<td>Bako, Jimma Mekane areas</td>
<td>Nov./Dec., 2016</td>
<td>25,000</td>
</tr>
<tr>
<td>1.4.3 Evaluate tool design</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>To be evaluated in 2017</td>
<td></td>
</tr>
<tr>
<td>1.4.4 Institutionalizing the tool</td>
<td></td>
<td>Partners meeting held to institutionalize the tool</td>
<td>Country project coordinator, EIAR, Jens Andersson</td>
<td>Addis Ababa</td>
<td>March, 2016</td>
<td>See budget for NE tool</td>
</tr>
<tr>
<td>1.4.5 Out scaling of the tool</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>In the year 2017</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Activities</th>
<th>Activity duration</th>
<th>Milestones</th>
<th>Responsible persons</th>
<th>Locations</th>
<th>Completion period</th>
<th>budget</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>WS7</strong></td>
<td></td>
<td>Increased capacity in national institutes (countries)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1.7.1 Postgraduate (PhD and MSc) training completed for host country nationals</td>
<td>April-Dec., 2016</td>
<td>2 MSC students from EIAR in ET &amp; 2 PhD students get their thesis work/field experiments started</td>
<td>Students, country coordinator, advisors</td>
<td>Tepi/Jimma, Bako and other locations</td>
<td>Dec., 2016 &amp; beyond</td>
<td>16,000</td>
</tr>
<tr>
<td>1.7.2 Technical training of research and extension staff in the use and application of TAMASA tools and SOPs</td>
<td>Dec., 2016 &amp; beyond</td>
<td>10 EIAR and 10 MoA extension staff trained on the use of NE tools</td>
<td>Country coordinator, IPNI</td>
<td>Addis Ababa</td>
<td>Dec., 2016 and beyond</td>
<td>10,000</td>
</tr>
<tr>
<td>Core Activities-2016</td>
<td>Total est. Budget</td>
<td>EIAR</td>
<td>CIMMYT</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-----------------------------------------------------------------------------------</td>
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<td>--------</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Panel survey (1.1.2)</td>
<td>50,000</td>
<td>40,000</td>
<td>10,000</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Descriptive analysis (1.1.3)</td>
<td>1,000</td>
<td>1,000</td>
<td>-</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Engage national institutes in data collection (agreement) (1.1.6)</td>
<td>6,000</td>
<td>6,000</td>
<td>-</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Training &amp; support for 2016 data collection (1.1.6)</td>
<td>10,000</td>
<td>5,000</td>
<td>5,000</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Ex-ante analysis to guide investment (WS2)</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Meeting with partners for NE &amp; V tools intro &amp; Institutionalization (1.3.1)</td>
<td>18,000</td>
<td>-</td>
<td>7,000</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Meeting with partners for NE &amp; V tools intro &amp; Institutionalization (1.3.4)</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. NE validation exps in AOI (1.3.2)</td>
<td>25,000</td>
<td>20,000</td>
<td>5,000</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. NE calibration at new FA - selected previous farms</td>
<td>25,000</td>
<td>20,000</td>
<td>5,000</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. Variety Calibration experiments (1.4.2)</td>
<td>25,000</td>
<td>20,000</td>
<td>5,000</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. V1 tools evaluation by users (1.3.3) (1.4.3)</td>
<td>5,000</td>
<td>-</td>
<td>5,000</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10. Training &amp; support for hosting (1.3.4)</td>
<td>5,000</td>
<td>-</td>
<td>5,000</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11. Postgraduate Students Research (PhD and MSc) (1.7.1)</td>
<td>16,000</td>
<td>-</td>
<td>16,000</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>12. Technical training of research and extension staff in the use and application of TAMASA tools and SOPs (1.7.2)</td>
<td>10,000</td>
<td>-</td>
<td>10,000</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>185,000</strong></td>
<td><strong>106,000</strong></td>
<td><strong>79,000</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Code activities-2016</th>
<th>EIAR</th>
<th>CIMMYT</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Panel survey</td>
<td>40,000</td>
<td>10,000</td>
<td>50,000</td>
</tr>
<tr>
<td>Descriptive analysis</td>
<td>1,000</td>
<td></td>
<td>1,000</td>
</tr>
<tr>
<td>Meeting with national agencies collecting yield data</td>
<td>6,000</td>
<td></td>
<td>6,000</td>
</tr>
<tr>
<td>Training &amp; support for 2016 data collection</td>
<td>5,000</td>
<td>5,000</td>
<td>10,000</td>
</tr>
<tr>
<td>Meeting with users for co-development &amp; institutionalization</td>
<td>7,000</td>
<td></td>
<td>7,000</td>
</tr>
<tr>
<td>NE validation exps in AOI</td>
<td>20,000</td>
<td>5,000</td>
<td>25,000</td>
</tr>
<tr>
<td>NE calibration exps in new FA</td>
<td>20,000</td>
<td>5,000</td>
<td>25,000</td>
</tr>
<tr>
<td>V1 tools evaluated by users</td>
<td>5,000</td>
<td></td>
<td>5,000</td>
</tr>
<tr>
<td>Training &amp; support for hosting</td>
<td>5,000</td>
<td></td>
<td>5,000</td>
</tr>
<tr>
<td>Calibration of NE tool prediction</td>
<td>20,000</td>
<td>5,000</td>
<td>25,000</td>
</tr>
<tr>
<td>Postgraduate (PhD and MSc) research at host country</td>
<td></td>
<td>16,000</td>
<td>16,000</td>
</tr>
<tr>
<td>Technical training of research and extension staff in the use and application of TAMASA tools and SOPs</td>
<td>10,000</td>
<td></td>
<td>10,000</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>106,000</strong></td>
<td><strong>79,000</strong></td>
<td><strong>185,000</strong></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>CIMMYT-TAMASA Budget-2016-Ethiopia</th>
<th>Budget amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>CIMMYT support for field trials</td>
<td>15,900</td>
</tr>
<tr>
<td>Transport, vehicle use &amp; maintenance</td>
<td>10,000</td>
</tr>
<tr>
<td>MSc research support costs</td>
<td>13,390</td>
</tr>
<tr>
<td>Workshops &amp; training for partners &amp; tool users</td>
<td>18,000</td>
</tr>
<tr>
<td>Local in-country travel Ethiopia</td>
<td>6,180</td>
</tr>
<tr>
<td><strong>Total-operational</strong></td>
<td><strong>63,470</strong></td>
</tr>
</tbody>
</table>

Budget difference

79,000 - 63,470 = 15,530 ??
Nutrient Expert WS3

Innovations in agronomy at scale: lessons from One Acre Fund

Core Program
- Core countries: Kenya, Tanzania, Rwanda, Burundi
- 400,000 + smallholder farmers
- Pilot countries

What has been achieved at scale?
- Kenya: 3.3 t/ha
  230,000 farmers
- Rwanda: 3.2 t/ha
  100,000 farmers
- Burundi: 3.4 t/ha
  40,000 farmers

Taking Maize Agronomy to Scale in Africa

Two points:
1. Maize agronomy
   - Seed choice
   - Fertilizer choice
   - Land prep
   - Planting timing
   - Planting spacing
   - Fertilizer timing
   - Fertilizer placement
   - Weeding
   - Pest and disease management

2. Scale
   - 1000 farmers?
   - 10,000 farmers?
   - 100,000 farmers?
   - 1 million farmers?

1AF goal – 1 million farming families by 2020

Setting the stage

How?

Figure 1: Average cereal grain yields in 2005. Sub-Saharan Africa can revert from 1.5-2 t/ha by increasing access to improved seeds and technologies. Going from 2.0-3.5 t/ha will require interventions across the agricultural value chain. Achieving 5.0 t/ha is agriculturally possible, but beyond the scope of current interventions.

Source: 2015
What is possible?

Figure 1: Average cereal grain yields in 2015. Sub-Saharan Africa can move from 1 to 2 t/ha by increasing access to improved seeds and fertilizers. Going from 3 to 5 t/ha will require interventions across the agricultural value chain. Achieving 10 t/ha is agronomically possible, but beyond the scope of current interventions.

Sanchez, 2015

Kenya maize yields - 2015

Yield potential: 5.0 t/ha (at least)
Yield gap: 3.7 t/ha
Mean: 3.3 t/ha
Low-yielding farmers: 25%
All districts 25% of farmers below average!

Tanzania maize yields - 2015

Yield potential: 5.0 t/ha (at least)
Yield gap: 0.6 t/ha
Mean: 4.0 t/ha
Low-yielding farmers: 25%

Rwanda maize yields - 2014A

Yield potential: 5.0 t/ha (at least)
Yield gap: 0.5 t/ha
Mean: 3.0 t/ha
Low-yielding farmers: 25%

Rwanda maize yields - 2015A

Yield potential: 5.0 t/ha (at least)
Yield gap: 2.2 t/ha
Mean: 3.2 t/ha
Low-yielding farmers: 25%
Can we predict and optimize planting timing?
Year 1 results & plans & protocols for validating/ testing recommendation

Use Case Need, Objectives and Outputs
- Nutrient management challenges for maize production intensification
  - Low fertilizer use
  - Inappropriate and blanket fertilizer recommendations
- Suitability of maize fertilizer recommendations is affected by complex variability in soil fertility, climate and socio-economic factors at various scales.
- The lack of site-specific fertilizer recommendations and tools to deliver them to farmers is a major challenge for maize production intensification.
  → Site-specific nutrient management decision support tools prioritized by strategic partners

Use Case Outputs: Nutrient Expert

Use Case Need, Objectives and Outputs
Main Outputs
- Nutrient Expert (and associated tools) for maize decision support tool for use by extension systems to develop and promote farm-specific nutrient management recommendation.
- Nutrient Expert extension formats for use by partners in taking site-specific fertilizer recommendations to scale.
**Use Case Main Activities (YR-1)**

<table>
<thead>
<tr>
<th>Activity</th>
<th>Nigeria</th>
<th>Outlook</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nutrient omission trial protocol</td>
<td>Develop and spread guidelines and protocols for the implementation of on-farm maize nutrient omission trials</td>
<td>Std protocols developed</td>
</tr>
<tr>
<td>Nutrient omission trials</td>
<td>Establishment of multi-location nutrient omission trial in 3 countries</td>
<td>Trials completed in KE and BT, ongoing in TZ</td>
</tr>
<tr>
<td>Partner engagement</td>
<td>Identification and engagement of primary service provider partners (NARS and non-profit sectors) and farmers for site-specific nutrient management recommendations (e.g., soil testing and farmer field days)</td>
<td>Completed</td>
</tr>
<tr>
<td>Nutrient Expert Calibration</td>
<td>Algorithm and decision rule based on the GUFEES model adapted to Nigeria and Ethiopia</td>
<td>Ongoing</td>
</tr>
</tbody>
</table>

**Objectives of Nutrient Omission trials**

- To gain understanding of the local maize production system and the influence of farm socio-economic and soil fertility variability, and historical and current management practices on maize yields.
- To develop maize yield, yield response and nutrient uptake datasets for parameterization of NE algorithms to develop SSNM practices under variable soil fertility and climatic conditions in TAMASA project pilot sites.

**NOTs established**

- **Ethiopia**: 88 (TAMASA = 47, IFAD = 41)
- **Nigeria**: 120 (TAMASA = 40, SARDC = 80)
- **Tanzania**: 135 + 117

**NOTs results - Nigeria**

- N & P are the nutrients most limiting yield in Nigeria

**NOTs results - Nigeria**

- Maize response to nutrient varies from location to location
- Dandume, Funfua, Bunkure responded to micro-nutrients
NOTs results - Nigeria

- Maize response to nutrient varies from location to location

NOTs results - Nigeria

- The relationship between yield in omission plot and yield with NPK in maize.

NOTs results - Ethiopia

- Nitrogen is the nutrient most limiting yield in both Bako and Gobu sayo
- K & P are also important in Gobu sayo
- Yield was depressed when micro-nutrients were applied

NOTs results - Ethiopia

- No yield response to each nutrient in some areas

NOTs results - Ethiopia

- Nitrogen was the nutrient most limiting yield in both Omonada and Kersa districts.

NOTs results - Ethiopia

- Yield response to nutrients in Bako, Gobu sayo, Kersa and Omonada districts in Ethiopia.

<table>
<thead>
<tr>
<th>Districts</th>
<th>Yield response (q/ha) due additional nutrients</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
</tr>
<tr>
<td>Bako Tibe</td>
<td>24.6</td>
</tr>
<tr>
<td>Gobu sayo</td>
<td>37.2</td>
</tr>
<tr>
<td>Kersa</td>
<td>34.9</td>
</tr>
<tr>
<td>Omonada</td>
<td>35.0</td>
</tr>
</tbody>
</table>
Engaging partners on the use of NE

TAMASA Primary partners in Nigeria

- Managed to engage TAMASA primary partners.
- Nigeria
  - NE users: SG 2000; NOTORE; DOREU partners; ADA
  - NE host institution: BUK
- Ethiopia
  - NE users: MOANR; SG 2000; GIZ
  - NE host institution: EIAR – Land, Water Resource Research directorate

Feedback on the use of NE from Nigeria

- The value of NE
  - NE is highly efficient and easy to understand and operate
  - NE will solve the issue of blanket nutrient application as it provides estimate of fertilizer recommendations for specific sites
  - NE will help to forecast economic returns and expected yield
- Suggestions for improvement
  - Questions are too many in the procedures/steps if possible be reduced
  - NE should be made to be operative with other applications such as mobile smart phones for portability
  - NE should meet the need of other crops such as cowpea because most farmers are rotating maize with legumes
  - There is need to include all the states in Nigeria

Feedback on the use of NE from Ethiopia

- The value of NE
  - Enabling to give site specific fertilizer recommendation
  - Calculation of the economic benefits from the fertilizer input
  - It is in harmony with fertilizer recommendation strategy of the country (Ethiopia data could be used)
- Suggestions for improvement
  - Quantification of the inherent soil fertility is missing (e.g., pH, OM, Av.P and Exch.K, trace elements)—only limited on solor and soil texture
  - Source OM (composts has to be included)
  - Other crops should be included
  - Lime requirement as option for yield improvement

Engaging partners on the use of NE

- NE workshops in Nigeria and Ethiopia conducted:
  - Orient extension partners on the scope and use of NE in the development of site-specific nutrient management and fertilizer recommendations
  - Evaluate the use of NE for different for extension partners, and identify partners’ specific needs and demands for its effective use in specific intervention areas
  - Develop action plans for the co-development of NE and other related applications

Key message – NE workshops

- The partners have demonstrated their willingness and commitment to participate in the co-development of the NE
- Partners especially in Nigeria have noted that NE will also help them to provide efficient and effective services to farmers and hence build a strong relationship with their clients
Lessons Learnt

- Partners’ needs depend on country as influenced by country’s current development of fertilizer recommendations.
- Feedback from partners depends on the nature of the participants and the existing extension system:
  - extension agents versus researchers with great influence on extension agents.
- One-on-one engagement with primary partners is critical for building trust between TAMASA and its core partners.
- Understanding the current development of fertilizer recommendations and existing extension system in each country is important for identifying entry points to streamline the NE decision support tool in the existing programs.

NOTs for the 2016 season

- Out of the total trials established in the first season about 50% will be repeated on the same experimental sites in the second season in each of the three countries.
- The set of sites to be selected are decided based on cluster analysis to select sites that are representative of categories of growing conditions, treatment effect and yield response.
  - Ethiopia – 40
  - Nigeria – 50
  - Tanzania – 100
Plans for tool co-development & institutionalisation

NE-tool institutionalization - ET

**Tool hosting**
- CIAR-LWR - Land & Water resources directorate
- TAMASA focal point
- limited database hosting experience
- MoANR - Ministry of Agriculture
- soil fertility improvement directorate (NRM)
- building database on digital green?
- AAT - Agricultural Transformation Agency
  - facilitating institution
  - currently running ETH-CODIS - separate institute soon
  - data source for soil, soil sample analyses...

**Tool users**
- MoANR - NRM extension: DA’s at kebele and T level
- SG 9000 - demonstrations, demo farmers, DA’s
- OIG - demonstrations, training of farmers, DA’s

3 types of trials in NE-tool development

1. Calibration and validation trials (NIT)
   Key question: how well does NE tool predict input-output relationship, based on experiment?

2. Performance trials (researcher managed)
   Key question: How does performance yield of NE recommendation compare with different other fertilizer recommendations?

3. Farmer ‘try-outs’ of NE recommendations (early impact assessment)
   Key question: How does NE recommendation (fertilizer mix and mgt. practice) compare with farmer fertilization practice, under equal fertilizer investment level.

NE-tool institutionalization - ET

Concerns/discussion points
- Need for understanding “downstream” user needs
- training in NE-tool use DA’s (extension)
- MoANR extension directorate NRM
- Geo-optimization of NE recommendations
- NE as learning tool and data source
- NE-tool/database hosting.
- EAP, MoANR, infrastructure, “digital green”, CoCo?
- NE-tool: from “yield target” to investment level?
- Are farmer’s yield or production focused?
- Addition of DSS to advise Farmers (see table below) (not over-estimating all NE experience in Asia shown)
- NE tool diversification: Desktop and smartphone
- DA’s need to provide NE recipe for farmer try-outs
**NE-tool institutionalization - ET**

**Planning**
- Engaging 'downstream' NE-tool users
- Training in NE-tool use DAs (extension) for feedback
- For NE recommendations to APS survey yr-2
- Geo-spatialization of NE-tool + recommendations
  - NE as learning tool and data source (output file storage, retrievable)
- NE-tool / database hosting
  - EiAR, MoANR, ETHILOG3T, infrastructure? (digitalgreen CoCo?)
- Training in database mgmt.
- Development of smartphone app (operational after APS 1)

---

**Variety-tool institutionalization - ET**

**Tool hosting**
- National Variety Release Committee (NVRC)
- Standing committee, chair prof. Frew Shikelf (Mekeba)
- Secretariat in MoANR (crop directorate)
- EiAR-crop - crop directorate
  - Limited database hosting experience
- MoANR - Ministry of Agriculture
  - Crop directorate (NRM)
  - Building database handling capacity (digitalgreen?)
- ATA - Agricultural Transformation Agency
  - Facilitating institution

**Tool users**
- MoANR - crop extension: DAs at kebebe and 7 level
- ...
PhD programs WS7

PhD Program in Nigeria

PhD programmes in Nigeria in collaboration with KU Leuven
Jan Diele

- Nutrient imbalances (related to NOT trials): BELLO MUHAMMAD SHEHU (Supervisors: Roel Merckx, Miet Maertens, Jan Diele)

- Matching maize varieties to different soils and agro-climatic conditions: ADNAN AMINU ADNAN (Supervisors: Jan Diele, Roel Merckx, Miet Maertens)

- Ex-ante and ex-post socioeconomic evaluation of the nutrient export tool: OYINBO OYAKHILOMEN (Supervisors: Miet Maertens, Jan Diele, Roel Merckx)

OPTIMIZING PRODUCTIVITY OF MAIZE IN THE NIGERIAN SAVANNA AGRO-ECOLOGICAL ZONE: INFLUENCE OF NUTRIENT LIMITATIONS AND IMBALANCES
BELLO MUHAMMAD SHEHU

Objectives
✓ Establishment of nutrient norms, critical and optimal ranges.
✓ Diagnosis of nutritional limitations and imbalances.
✓ Modelling of site-specific nutrient requirements.

Activity 1: On-Farm Nutrient Omission Trials (NOT)
- Farmers: 10 farms will be randomly selected from each LGA (10/10=100)
- Treatments: Two sets of trials will be conducted in each location one with CIPV and the other with a hybrid variety. The treatments consist of: no fertilizer (control), PK, NK, NK, NPK, and NPK+Urea+MgO.
- Duration: Two years (2015 and 2016 rainy seasons)
- Soil Sampling and Analysis: Particle size distribution, pH, OC, and all essential plant nutrients.
- Plant Tissue Sampling and Analysis: All essential plant nutrients in the ear leaf, grain and the stover.

Activity 2: Modelling of Site-Specific Nutrient Requirement

Calibration of QUILTTS model
- Data from NOT will be used to calibrate QUILTTS model where fertilizer recovery, indigenous nutrient supply, and nutrient use efficiency and yield responses to nutrient application.

Validation of QUILTTS Model
- Experimental sites: 5% fields from NOT sites selected (2 from Sudan Savanna and 4 from Northern Guinea Savanna).
- Treatment: zero fertilizer control plus three nutrient recommendations obtained from QUILTTS by setting the yield at 60%, 65%, and 70% of the potential yield.
- Experimental Design: a randomized complete design (RCBD) will be used with three replications.
- Duration: Two years (2016 and 2017 rainy seasons)

MATCHING MAIZE VARIETIES TO DIFFERENT SOILS AND AGRO-CLIMATIC CONDITIONS OF NORTHERN GUINEA AND SUDAN SAVANNAS OF NIGERIA USING SIMULATION MODELS
ADNAN AMINU ADNAN

Objectives
✓ Estimate cultivar coefficients of maize varieties produced in Sudan Savanna (SS) and Northern Guinea Savanna (NGS) of Nigeria.
✓ Evaluate the sequential approach method of generating cultivar coefficients with CERES-maize by using data generated via field measurements and data from yield evaluation trials.
✓ Evaluate the effect of varying planting densities of maize across SS and NGS of Nigeria and validation of CERES-Maize Model for the ability to predict planting density of maize.
✓ Develop variety suitability maps to be used as decision-support tools for maize varietal selection across the SS and NGS.
Estimation of Cultivar Coefficients (Calibration)

From field calibration trials
Four trials (1 in each of 4 locations) conducted first in the dry season under full
imposition and then repeated in the wet season using supplementary imposition when
necessary in 2018.

<table>
<thead>
<tr>
<th>SN</th>
<th>Location</th>
<th>Zone</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Research Farm, Bayero University Kano</td>
<td>SS</td>
</tr>
<tr>
<td>2.</td>
<td>Irrigation Station, Auchi State College of Agriculture, Danbata</td>
<td>SS</td>
</tr>
<tr>
<td>3.</td>
<td>Institute for Agricultural Research, Ahmadu Bello University, Zaria</td>
<td>NGS</td>
</tr>
<tr>
<td>4.</td>
<td>Kaduna Agricultural Development Agency (KADAP)</td>
<td>NGS</td>
</tr>
<tr>
<td>Irrigation Research Station, Saminaka</td>
<td>NGS</td>
<td></td>
</tr>
</tbody>
</table>

Yield Evaluation Trials
Data from evaluation trials by breeders across multiple seasons and locations will be
collected. Data must be from at least 6 years and 5 locations for each variety, under
proper management, and details of soil analysis and weather reports must be
available.

Factors
- Varieties = 10 per (AEZ)
- Sowing Density = 3
- LGAs = 3 per AEZ
- Farmer Class = 5

Number of Farmers/Site
- No. of farmers per class = 2
- No. of farmers per LGA = 10
- Total No. of Farmers/AEZ = 30 (3 LGAs x 10 farmers)

Experimental Design
- Fractional factorial design with farmers serving as blocks accommodating 10 treatment combinations

Observations
- Grain yield, Biomass at tasseling and harvest, harvest index

On-Farm Validation Trials

- Number of Villages: 10 in 6 LGAs = 60 Villages

- 10 early and extra early varieties in the SS and
  10 intermediate and late varieties in the NGS

<table>
<thead>
<tr>
<th>LGA</th>
<th>State</th>
<th>Zone</th>
<th>Sites</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bunkure</td>
<td>Kano</td>
<td>SS</td>
<td>10</td>
</tr>
<tr>
<td>Garin Mallam</td>
<td>Kano</td>
<td>SS</td>
<td>10</td>
</tr>
<tr>
<td>Kuru</td>
<td>Kano</td>
<td>SS</td>
<td>10</td>
</tr>
<tr>
<td>Doganu</td>
<td>Kano</td>
<td>NGS</td>
<td>10</td>
</tr>
<tr>
<td>Lere</td>
<td>Kaduna</td>
<td>NGS</td>
<td>10</td>
</tr>
<tr>
<td>Ilora</td>
<td>Kaduna</td>
<td>NGS</td>
<td>10</td>
</tr>
</tbody>
</table>

Next steps …
Weather data: Gridded data from NASA vs. MarkSim vs weather station data
Scenario analysis with CERES-MAIZE: 50 years of daily weather data * soil properties * varieties * sowing density
Summarize data in suitability maps: what are most suitable varieties and densities?

Agricultural Intensification through Nutrient Expert Decision Support Tools: Evidence from Maize-Based Systems of Nigeria

OYINBO OYAKHILOMEN

General Objective
- The general objective of this research is to undertake an ex-ante and ex-post socio-economic evaluation of key stakeholders (farmers and extension agents) in the uptake and scaling up of NE tools in Nigeria.

Specific Objectives
- To determine farmers’ preferences for extension advice from NE decision support tools, heterogeneity and willingness to adopt NE tool recommendations
- To determine extension agents’ preferences for NE decision support tools, heterogeneity and willingness to adopt NE tools
- To determine heterogeneous impact of farmers’ exposure to NE-based fertilizer recommendations on fertilizer use, complementary inputs, yield and income

Study Area
- Northern Guinea Savanna-Kaduna State
- Local government areas with TAMASA activities (NOTA)

Sampling
- 2 Local government areas (Lere and Makarfi), 4 Districts, 45 villages
- Villages should have no project on fertilizer recommendation such as OPRA
- 450 farmers, 150 village extension agents

Data Collection
- Data will be collected from both farmers’ and extension agents
- Choice cards, structured questionnaire and FGD will be used to collect data
- Researcher and trained enumerators will carry out the data collection
Key activity one: Choice Experiment (CE)

- There will be two CEs for this research: farmers’ and extension agents’
- Consultation with researchers and experts in CE design to identify attributes of NE tools and their levels
- The construction of choice cards or sets based on identified attributes of NE tools and their levels
- The CE will be optimized using D-efficiency criterion to make it easy to implement
- The two CEs will be implemented in 2016 to be preceded by a pilot survey
- Alongside the CE, data on risk and time preferences of the farmers’ will be obtained using a multiple price lottery
- 450 farmers, 150 village extension agents will be involved in the CEs

Key activity two: Randomized Control Trial (RCT)

- The RCT for this research will consist of three treatments:
  - Treatment one (farmers exposed to NE-based fertilizer recommendations from the pre-release version known as beta version)
  - Treatment two (farmers producing under current extension fertilizer recommendations)
  - Treatment three (farmers producing under their own fertilizer management practices)
- Randomization will be done at the village level: 15 villages per treatment (45 villages), 150 farmers’ per treatment (450 farmers’)

Time plan:
- 2015: Baseline or ex-ante survey
- 2016: Dissemination of NE-based fertilizer recommendations
- 2018: Follow-up survey

Wageningen University

Wageningen University, the Netherlands Plant Production Systems Group
A farming systems perspective.
Dr. A.G.T. Schuit

Linking TAMASA with current projects

- Global Yield Gap Atlas + N2Africa
- STARS ISABELA
  - Spurring Transformation in Agriculture through Remote Sensing
- IMAGINE
  - Integrated assessment of the determinants of the maize yield gap in Sub-Saharan Africa: towards farm innovation and enabling policies
- GEODATICS (Ltd)
  - Tailored fertilizer advice via mobile phone
  - Farmer interviews + Wageningen models + satellite imagery
Maize yield gaps
An integrated assessment

- Major hypothesis
  - Yield gaps are related to poverty and farmer endowments
  - Farmer endowment determine crop management and technology adoption
  - Bio-economic modelling can predict impact of technology on food security and poverty

Mitigating yield gaps
Exploration and re-design

- Hypothesis
  - Participatory co-design with farmers using farming systems models provides realistic intervention options
  - Best interventions are specific for CDAs and farming systems
  - Experiments and demonstration allows upscaling to CDAs.

Spatial variability
Reducing technological risks

- Hypothesis:
  - Nutrient response curves vary between and within fields
  - Spatial variability of fields affect nutrient response curves
  - Knowledge of spatial variation in crops assist in improved NUE
**Understanding risks: soy beans in Ghana**

![Graphs showing yield data](image)

*Figure 1. Cumulative probabilities of the extra yields when only applying 60 kg P / ha (A) or in combination with inoculant (B) for legumes for soils with poor (---), good (---), good N (1000 kg N/ha) or good (---), yield of 1200 kg P/ha yields in the control plots. The break-even point at 250 kg grain / ha is based on a base price of 3.4 USD / kg soy at a cost of 1.45 USD / kg N. (Data from data collected in the Nutrese project, Calle et al., 2014 press. comm.)*

---

**Farmer decisions in relation to risk**

*When farming becomes a risky business*

- **Hypotheses:**
  - Real and perceived risks differ among farm types.
  - Risk reduction strategies depend on gender and household composition.
  - Risk management strategies are key to adoption of technology.

- **Practical questions**
  - Local supervision
    - Best location for PhD students
  - TZ: location of experimental sites
  - Logistics of flight missions
  - Availability of drones for experiments

---

**Thank you!**

*Latest news, projects, models, data on the PPS group website!*

---

**Applications**

- Interpretation of seasonal forecasts (SO WHAT IF THERE IS AN 80% CHANCE OF RAIN OVER THE NEXT MONTH BEING LOWER THAN AVERAGE??)
- Near-term decision making (HOW MUCH DOES IT HAVE TO RAIN OVER THE NEXT TWO WEEKS FOR CROPS NOT TO DIE?)
- Index insurance (IF THERE IS AN INDEX BREACH WHAT WILL OUR LOSSES BE AND HOW MUCH DOES THIS VARY FROM YEAR TO YEAR?)

---

**Development of a drought early warning system/decision support tool, by combining multiple streams of observational/forecast data**

- Two studentships:
  - Studentship 1: development and evaluation of the technology for producing root zone soil moisture estimates using TAMSAT
  - Studentship 2: development of a decision support tool for combining multiple sources of meteorological information into a suite of resources for management of drought
Development of a drought early warning system/decision support tool, by combining multiple streams of observational/forecast data

Two studentships:
- Studentship 1: Amsalework Eijio – Ethiopian national, who is a mathematician and Lecturer on AIMS (African Institute of Mathematical Sciences) programme. Supervised by Tristan Quaife and Amos Lawless
- Studentship 2: Dagmawi Asfaw – Ethiopian national, who has an agronomical background and lecturing experience. Supervised by me and Ross Maidment

New methods: whole season risk: www.droughtforecast.org

Agricultural Risk (function of whole season SM)

Past – Historical climate Future – Unknown climate

New methods: whole season risk: www.droughtforecast.org

Agricultural Risk (function of whole season SM)

Past – Estimate of soil moisture Future – SM from JULES forced with a weighted climatology

The condition of the land surface affects near-term soil moisture
The condition of the land surface affects near-term soil moisture.

Seasonal evolution of soil moisture:
- Day of year
- Soil moisture

Knowledge of soil moisture is the key:
- Forecasts are based on a range of possible precipitation scenarios. Uncertainties in soil moisture significantly increase the ensemble spread.

Seasonal evolution of drought risk (Dagmawi’s project):
- Day of Year
- Temperature
- Probability of drought

Knowledge of soil moisture is the key:
- Soil moisture can be constrained using SMAP and TAMSAT within a JULES-based data assimilation system.
Experimental data assimilation (Amsale’s project)

Bringing the projects together

Studentship 1 constrains soil moisture for forecast initialization

TAMASA programme suggests pilot studies and provide validation and feedback on usefulness

Applications

- Interpretation of seasonal forecasts (SO WHAT IF THERE IS AN 80% CHANCE OF RAIN OVER THE NEXT MONTH BEING LOWER THAN AVERAGE?)
- Near-term decision making (HOW MUCH DOES IT HAVE TO RAIN OVER THE NEXT TWO WEEKS FOR CROPS NOT TO DIE?)
- Index insurance (IF THERE IS AN INDEX BREACH WHAT WILL OUR LOSSES BE AND HOW MUCH DOES THIS VARY FROM YEAR TO YEAR?)

Next steps

- Continue to run the pilot operational system for Ghana and (soon) for Zambia. ADDITIONAL CASE STUDIES? (TAMSAT group + Dagmawi)
- Metrics of drought risk IDEAS FROM TAMASA PARTNERS? We can look at most quantities.
- Start to look at SMAP data for the DA (Amsale)
- Scaling out using satellite-based rainfall. TAMSAT, ARC, CHIRPS... (Dagmawi)
- Incorporation of seasonal forecasts. The technology is there but method is naive. (Dagmawi)
Variety tool WS4

Plans & protocols for calibration

**OBJECTIVE**

- To increase maize production by identifying the varieties with desired growth seasons for a specific site and specific planting date (period)
- To enhance farmers' ability to predict the stage of maize development for more efficient management decisions, such as timing of the application of pesticides, synchronizing cross-pollination

**Co-development**

Schematic representation of crop system model

- Biotic environment
- Climate variables (rainfall, temperature, humidity)
- Management practices
- Soil characteristics

What are the keys determinant factors for predicting phenology or yield?

**Co-development spatial approach**

- Products
  - Compute software
  - Smart phone application

**Calibration and validation**

- There are several response functions that have curve similar to the graph above - through calibration, you determine the best function for your input data and location
- Validation: require comparing the tool output with experimental result
  not used for calibration
Evaluation tool performance

- The tool is used to provide recommendations in a location in advanced and then data collection is conducted to evaluate the level of the prediction accuracy of the tool.

Capacity to use the tool

- Training people on how to use the tool and produce output and how to interpret the output to provide recommendations.

Institutionalization

- Co-development
- Calibration and validation
- Evaluate performance
- Capacity development

Institutionalization

Keys Discussion points?

- What are the key determinant factors to use for predicting maize phenology? and yield?
- If rainfall is to be considered as important factor do we have means and time to calibrate and validate the tool using different rainfall response functions?
- What factors shall we considered under ideal conditions?

Keys Discussion points?

- Which institution is willing to joint TAMASA team for the co-development of the tool?
- What else do you like the tool to do? It is a must to include yield prediction?
- How will you want the tool to be presented? It is in form of desktop software? or smart phone app? or both?
- Who are the potential users of the tools.
Use of UAVS: STARS in WCA

**Value propositions for STARS-ISABELA**
- Land information services
  - Merging fields (satellite imagery)
  - Registration of land users
- Crop recognition algorithms
  - Characterization of crop patterns
  - Merging of crop types (satellite imagery)

**Connect farmers to value chains**
- Mobile phones for information exchange
- Timing of crop activities
- Yield predictions
- Informing the value chain
  - Agro-dealers
    - Estimates of product demand: delivery on-time
    - Acreage: advice from kg/ha to bags per acre/field
    - Planning of transport
  - Creditors
    - Farmer assets, crop status (collateral for credit)

**Mobile phones to send information to and collect from smallholders**
- Manobi
- Market Info+ Crop insurance
- Interface is available
- Provide add-on to existing products

**Crop characterization experiment Samanko, Mali**
- 

Led by P. Shibly, IRRI, WUR / UC Louvain / UD Sherbrooke / ITC-Twente
Mali partners: IER, AMEDD
Nigeria partners: IAR/CDA, NARDA
Study Area in Sukumba, Mali

- 50 fields around Sukumba
- On soil fertility gradient
- 5 major crop types
  - Incl. cotton, millet, maize, sorghum
- fortnightly images
  - ASI+NIR, 5-band
  - Worldview/GeoEye / rapidEye satellite imagery

Plant growth monitoring

- Fields include six plots (15x15m)
  - FP: farmer practise
  - CO: no fertilizer
  - Combinations of N+P+K
- fortnightly measurements:
  - 5 quadrats / plot
    - Light interception/LAI
    - ground cover
    - plant height
    - CHL (SPAD)
- PM-OM for veg. and gen. parts

Maize growth and development

<table>
<thead>
<tr>
<th>Grain yield (kg/ha)</th>
<th>CV% (plot)</th>
</tr>
</thead>
<tbody>
<tr>
<td>FP 6415</td>
<td>45</td>
</tr>
<tr>
<td>L0 5176</td>
<td>41</td>
</tr>
<tr>
<td>L1 5968</td>
<td>38</td>
</tr>
<tr>
<td>L2 5964</td>
<td>35</td>
</tr>
<tr>
<td>L3 6863</td>
<td>27</td>
</tr>
</tbody>
</table>

Maize, mean of 10 fields

<table>
<thead>
<tr>
<th>Farmer Practise</th>
<th>NPK (kg/ha) 15-15-15</th>
<th>Urea (kg/ha) 46-0-0</th>
<th>SADP (kg/ha) 18-46-0</th>
</tr>
</thead>
<tbody>
<tr>
<td>L0</td>
<td>100</td>
<td>0/100</td>
<td>0/100</td>
</tr>
<tr>
<td>L1</td>
<td>-</td>
<td>0/100</td>
<td>100/0</td>
</tr>
<tr>
<td>L2</td>
<td>200/0</td>
<td>0/300</td>
<td></td>
</tr>
<tr>
<td>L3</td>
<td>-</td>
<td>0/300</td>
<td>200/0</td>
</tr>
</tbody>
</table>

Why an average doesn’t tell the story

Understanding E-AI
- Soil coverage
- Soil content / pending
- Soil “pace”

Millet/Sorghum growth

<table>
<thead>
<tr>
<th>Farmer Practise</th>
<th>Millet, AGE 6-11</th>
<th>Sorghum, AGE 6-14</th>
</tr>
</thead>
<tbody>
<tr>
<td>FP</td>
<td>1665</td>
<td>1811</td>
</tr>
<tr>
<td>L0</td>
<td>1710</td>
<td>1600</td>
</tr>
<tr>
<td>L1</td>
<td>1717</td>
<td>1541</td>
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<td>L2</td>
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<td>1517</td>
</tr>
<tr>
<td>L3</td>
<td>1720</td>
<td>1975</td>
</tr>
<tr>
<td>L4</td>
<td>1930</td>
<td>1822</td>
</tr>
</tbody>
</table>

HR Satellite imagery time-series

Challenges in heterogeneous landscapes

- Soil fertility / shading
- Organic matter content
- Micronutrients / insects
Digital globe WVII/III GeoEye imagery

Spatial variation
1. Crop type more important than fertilization
2. Irrigation is less important than crop type

Understanding spatial variability

Landscape and soil catena

Landscape variability

Sorghum fields in different catena position

NDVI vs green ground cover

- NDVI strongly correlates to GC
  - $R^2 = 0.80$, RMSE = 0.04
  - NDVI $= 0.28 + 0.415 \times GC$

- Relationship somewhat dependent on crop type
- Difference NDVI no improvement
eBee data processing

Ground Control
5-6 needed per flight for normal GPS

Figure 8: Ground control points (GCPs). Left: GCPs painted in bedrock. Right: GCP painted on constructed concrete beam.

Sebastian Bovéiks, 2014. Internship report WU

How to apply radiometric corrections?

- Within image intensity and response variations
  - Corrections with reflection panels not suitable
- Shadowed and bare soil pixels always present
  - Shadows are dark
- Soil-Line approach
  - Soils have constant Red to NIR ratio
    - Evidence et al. 1994, RS, 101, 337
  - Soil line can be derived from Red vs NIR scatter
    - Sallam, 2013, Remote Sensing 5, 453-4559
  - Rotate and shift using the soil line

From raw DNs to estimated reflections

What more can we extract from imagery?

- Local response to nutrient applications
  - Influence of spatial variation
- Point clouds to determine crop height
- Monitoring crop growth in 3D
- Quantifying nutrient deficiency
  - Relative to control
Satellite and eBee Veg. Indices

Plot ground cover vs eBee PVI & NDVI

Crop height from eBee
DSM difference with December

Crop height from eBee
DSM difference with DSM @ 21 December

What else?
Mapping *Messor Galla* harvester ant nests

Crop type differences

- NDVI/PVI strongly relates to ground cover
  - DG-image ($r^2=0.81$) and eBee ($r^2=0.61$)
- Between field variation larger than within-field
  - Management $\rightarrow$ Crop type $\rightarrow$ Nutrient response
  - Sowing time, weeding
- Crops differ in VI response within landscape strata
- Crop height can be accurately measured with eBee
  - RMSE of 45 cm, sufficient to differentiate crops
  - (Cotton + peanuts) vs (maize + millet + sorghum)
  - Only accurate when sufficient GCP and careful processing!
Key lessons

- Ground control is essential
- eSee S110 NIR camera is not the best!
- Max 200 ha (~40 minutes) flight for battery life
- Standard DG satellite orthos are 2.3 m (!) off
- Very large variation in yields at plot scale (15*15 m), >50% CV
  - Science: requires many replicates for significant effects
  - Strata has major effect on growth curves
  - Crop type classification can only work within strata
- What is farmer yield? Production divided by which area?

Thank you!

ISABELA team
S. Tensh, A. Puga (IFOAM)
D. Agana (Kiwanda), M. Oli (CGSO)
K. Gaba (Flicka/OIC), B. Loghole (CGIBIO), P. M. Team (CGI)
K. Dufour, X. Elmas (CGI)
I. Coburger-Geisler (CGI)
A.R. Small (CGI), A. Zulu (CGI)
Z. Heirman (CGI)
Household panel, agronomy & yield survey & ex-ante framework

Agronomic Panel Survey

**Objective**
- Review and agree on a common set of SOPs for farm household, soil & yield data collection
- Starting this year, these data collection activities are integrated within the agronomic panel survey (APS)

**Purpose of the APS**
- Describe spatial/temporal patterns in maize yields and agronomic practices
- Understand the contribution of agronomic practices and other management decisions on yields
  - after controlling for soil, terrain and weather conditions
- Measure costs of inputs at the farm gate and thereby measure profitability of maize production
- Baseline for measuring impacts of selected interventions
  - randomly distributed as "treatments" to the surveyed sample

**Sampling farm households**
- Within 10km² grids, we randomly select farm households for inclusion in the Agronomic Panel Survey sample
- Aiming at 600-800 households per country
  - Tanzania: 30 households in 26 grids = 780 households
  - Ethiopia: 50 households in 12 grids = 600 households
  - Nigeria?
- Sampling strategy varies by country:
  - Tanzania: utilize 1km² sub-grids used by AFIS; do quick listing exercises within
  - Ethiopia: do listing exercises in sub-villages within 10km² grids
  - Nigeria?

**Data collection partnerships**
- Tanzania
  - Sustainable Intensification Lab (MSU, SUA) will co-finance data collection and analysis, using a mutually agreed instrument
  - Enumerators from SUA
  - Supervision from TAMASA, MSU, others?
- Ethiopia
  - Data collection through EAIR & CSA
  - Collaboration with IMAGINE project (supplemental data collection)
- Nigeria
  - ?

**Agronomic panel survey components**
- Household questionnaire
- Community questionnaire
- Soil sampling on focus plot ("largest maize plot")
- Crop cuts on focus plot ("largest maize plot")
- Complementary data from UAV sensors (Tza, Nga only)

**Agronomic panel survey timing**
- 2016
  - Harvest period only
  - Questionnaires, crop cuts, soil samples
- 2017
  - Pre-planting, mid-season, harvest
  - Questionnaires (divided), crop cuts (harvest), (soil samples?)
- 2018
  - Pre-planting, mid-season, harvest
  - Questionnaires (divided), crop cuts (harvest), (soil samples?)
APS panel definition

- Panel observations are farms & (with caveats) plots
  - Allows observation of dynamics
  - Allows econometric controls for time-invariant factors
- Plot-panel complicated by:
  - Changes in boundary
  - Changes in composition (e.g. If no longer maize)
- Possibly responses:
  - Drop observation (treat as attrition)
  - Replacement (lose panel, but aids pooled cross-sectional analysis)
  - Expand observations

Questionnaire components

- Household composition
- Farm overview, plot roster
- Current season production (plot-level, farmer info)
- Previous season crop output & use (crop-level, farmer recall)
- Livestock production (current season)
- Non-farm income (current season)
- Assets (current season start)
- Innovation, nutrition, risk aversion
- Main plot details (+ soils + crop cuts)

Questions on survey instrument

- Tradeoffs between length & detail/quality
  - What can/should be cut? (added?)
- Two versions of questionnaire?
  - Standard version for us; "light" version for partners... what components?

Soil SOP

- See ‘baseline soil & yield survey_v2’
- All three countries & some partners used the SOP, ODK, QR codes successfully
  - Training is straightforward
  - Are any modifications needed?
  - Proposal is to use this SOP without any changes

Yield SOP

- Measure field area, yield & no. stands
- Ask farmer about variety and whether fertilizer was applied
- Any problems & improvements?

Questions
- No. reps
- Questions for the farmer
  - Sowing date
  - Sex of the farmer
  - Amount & type of fertilizer (nb units)
  - No. weedings
  - Other?

Agronomy SOP

Purpose

- Common set of observations in all experiments or partner fields
- Observations should be quantitative, non-destructive & explanatory

Current SOP (four parts)

- HH information & characteristics
- Vegetative stage
- Flowering stage
- Harvest stage
Notes from Meeting

Session 1: Gridded sampling (WS1, Peter, Julius, Jordan)

- Nigeria – maize-area was for OCP. TAMASA partners work slightly outside this
- AUC – 0.5 = random, i.e. can’t distinguish foreground from background. Is this correct? Yes it should be 0.5. High figures indicate bias in this process. Nb – for using AUC to test prediction it should be a high correlation. Therefore need to revise the analysis.
- Representative of soils but not other factors – HH. But?
- Or choose drivers, i.e. soil fertility, market, HH?
- Low sampling density is the issue?
- So within 1 km grids can do more stratified sampling of other factors

Action:
• Grid is method to manage logistics. So \( n \) what we can fund and then test to make these as representative as possible. AfSIS to help with stats.
• Within grids we can look at stratification. Is this needed and a hypothesis based selection?
• Better not to use AUC as this is a random process. Julius to talk to JC on this.

**Workplans**
• Note that there is institutionalisation & tool development and this is more important as an outcome than previously
• Robert – maybe you need a central institute to hold some database and analytical functions? Not possible to do this via national systems. Good thought.

**Tanzania**
• Meteorological data? Soils data? Soil moisture data? All useful for others, esp. PhDs
• AfSIS has UAV SOPs – Julius to follow up and adapt where possible.
• Budget for TZ – need to see this

**Nigeria**
• Panel will need revising from 100 to 500
• Role of NAERLS? Agreed to work with TAMASA. Any data from now or historic? Not known: do surveys with estimates from farmers. Not measured.
• BUK for NE institutionalisation
• IAR for variety institutionalisation
• Use of UAVs – important. More after Tom tomorrow.
• Tool development – need more feedback from users.
• Budget?

**Ethiopia**
• Need to look at budget

**One Acre Fund – David Guerena**
• Agronomy many aspects
• Scale critical to reach 100k to millions
• 3 t/ha possible with access seed and fertilizer
• 1 supervisor for 200 farmers (1000 pax with family)
• lot of geospatial variability – how to avoid this?
• e.g. Fertilizer timing – growth stage timing
• for geospatial variability – e.g. contextual inputs, local adaptation
• variety selection – give farmers a crop catalogue. 15% yield advantage with best variety
• innovation in monitoring plant health, nutrition, disease, pest
• planting dates – telling farmers optimum times

**NE – Shamie, Jairos, Jens**
• 50% NOTs to be repeated in 2016 at same site. Why 50%?
• Sites selected on yield response. So ET 40; NG 60
• Need to look at data and decide on this – based on response/quality. Can be done for NG but not ET.
• Need also to see how representative locations were as well. This needs to be repeated and maybe new trials established.
• If NOTs were not representative then can we do validation? Yes we need for practical reasons and validation can contribute to more data and yield response (but not nutrient response). Julius to do test and select new sites from that point.
• Enough data to make a first version that can be used for validation.
• Validation –have some trials with partners – this is tool development rather than validation
• Treatments: control (zero fertilization); NE fertilizer recommendation (max yield or?); blanket/regional; soil-based recommendations
• Plus rapid farm survey for NE
• Suggest Jairos feeds back on treatments Tuesday; and consider survey as part of Panel? (or lite instrument).
• Treatments – recommendation based on target yield. Need small group to discuss this.
Jens
• Maybe MOANR better than EIAR and hosting. Limited hosting experience in both. Really should be Ethiosis
• Need more feedback from lower end users;
• Calibration/validation (NOT); performance on-farm (researcher managed); farmer try-outs
• Is yield target the way to do this? Better to do via investment level (because most farmers do not have enough seed or fertilizer so have to make the comparison)
• Need smart phone to reach large numbers to test.

PhDs
Need to share proposals.

Leuven - Jan
• Nutrient imbalances; NOTs, tissue analysis
• Varieties; 20 cvs varying in maturity; CERES-maize; planting density; variety suitability maps
• Ex-ante/ex-post of NE
• Students not all in same location but will work together
• What are outcomes?
• Why do choice and RCT?
• Integration?

Wageningen – Tom
• GYGA, STARS, IMAGINE, Geodatics (tailored fertilizer advice); many cross-fertilization responses
• Yield gaps – Bancha
• DEED and scaling via ED for technology – Workneh
• Spatial variability – Elias. More needed on spatial (field to km²)
• Farmer decisions in relation to risk - Violeth

Reading – Emily
• Soil moisture system SMAP and TAMSAT
• DSS on rainfall advice
• www.droughtforecast.org
- Link to TAMASA with forecasts at our sites and validation data
- Can produce drought risk and drive crop models

**Variety tool – Henri**
- Question – why not measure more parameters for modeling yield? Only phenology for this tool – not fully understood
- Could use simpler models with phenology to predict yield; consider this later. Yes, use statistical approaches or some simple data like interception/NDVI
- Overdesigned for phenology perhaps – multiple inputs

**STARS – Tom**
- Management >crop type> nutrient. Between field variation > within field
- NDVI / Plant veg height correlates with ground cover
- Lot of post processing needed for PVI
- Ground control essential; max area 200ha or 40 mins
- Very large variation yield at plot scale – 15 x 15m – many reps needed
- Good for growth data

**Agronomy Panel Survey**
- Still to be decided in Nigeria; but more spatial, more n and more socio-economic
- Socio-economic only once; agronomy in the season
- Maybe more on technology adoption (and reduce some other parts)
- Maybe need a ‘lite’ version for greater spatial and n; yes but what to include
- Where not maize – take a soil sample but not crop cut; use a new maize field
- Get inputs for ‘lite’ version; hiring in/out labour; training, networks external income, maize income vs farm income
- NDVI and digital analysis; very important how to process images
- Fertilizer amount – issues with this question
- Have group with Jordan PM on the survey
- Who is responsible in Nigeria?

**Data management – Henri**
- NETCDF – standard for gridded data
- Should have common interests with other projects and have common platforms
- Dataverse and CG data standards; Henri to lead for SIP

**General**
- Rahel introduction
- Communication strategy; get inputs on what and how, what is needed on website etc
- Sharing documents on Sharepoint
- M&E – use CIMMYT templates and develop this with coordinators
- Publication strategy
- Future meeting and cross-regional visits
- Support to training VT and HH surveys
- Four groups: NE, HH, UAV, PQC/PhDs
Robert comments
• Will request written
• Send annual reports etc
## Participants List

### Core Meeting

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Partner Meeting

Discussion on Nutrient Expert

The meeting was facilitated by Dr J. Rurinda and Dr J. Andersson

(1) Participants feedback, Nutrient Expert introduction session
- The partners indicated that the NE is going to be useful in Tanzania as it takes into account many characteristics for improving crop production.
- NE should not only focus on cereal crops (maize, rice and wheat) but also on other crops so that the tool is useful in many regions. There are many different crops grown in Tanzania. Is/will NE (be) developed for other crops?
- Incorporate soils data explicitly. What are the soils parameters used to develop the model?
- Incorporate rainfall data explicitly
- When experts use the tool, is there also a simplified version for farmers?
- Does the tool consider information on existing recommendations on the use of nutrients?
- NOT location choice could build on local expertise to take into account emerging nutrient deficiencies.
- Consider NOT's on ferrosols, those soils are tropical spoils which produce much maize, but many have specific problems such as copper deficiency;

For workplan:
- Consultation with agronomists in the country is needed to share experiences.
- Development of a dissemination and institutionalization strategies.
- Strategies to upscale the NE involvement in institutions to take up the tool, like commercially oriented farmers.

(2) Meeting on institutionalization Nutrient Expert tool with potential tool hosts

Present:
- Dr. Kajiru – DRD (Dept. of research & development)
- Dr. Mkangwa – Mlingano research institute, Tanga
- Dr. Joel Melyo, AFIS
- TAMASA: Jairos, Peter, Kenneth, Henri, Jens

Mlingano, Tanga (Director, Dr. Makwanga)
- Mandated to conduct soils research in TZ (has national soils lab for soil/fertilizer/plant/water sample analyses to serve CGIAR, and NARS); soil survey and land info. research; GIS lab; fertilizer use research.
- Has 15 scientists on soils research (most MSc, 1-2 diploma level, rest PhD), focusing on sisal, maize, beans, rice and cassava. Where present, they work crop boards (no crop board for maize).
- Mlingano is not responsible for fertilizer recommendations. These are staple food based, build on crop response, soils and rainfall and economic data adjusted for different sites. First recommendations date back to 1980s, then 1994, and these were recently revised. Aim is to make them more locally specific. Focus is on N, P and (recently) K and micro-nutrients.

TanSIS project, in Selian ARI, Arusha (Dr. Joel Melyo)
- 7 months old project focused on soil fertility appraisal, through new methods (AfSIS). 12 districts are done. Uses 4 labs (Mlingano, Ukilogumu in Mwanza, Uyole-Mbeya, Selian, Arusha), and SUA when more funds come available. The project does not have its own staff but it assigns the tasks to key research centers.
- Aims is to develop soil characteristic maps: pH, Sodium, SOC, P, K, and micro-nutrients and also identify soil fertility problematic areas.
- Database is currently in the cloud, (AfSIS), but the Ministry may have other ideas;

**DRD, Dar es Salaam (Director, Dr. Kajiru)**
- Responsible for research coordination among 16 institutions in 7 agro-ecological zones of TZ. Each zone has a head institution. Three directorates: (1) Crop Research (2) Socio-economics and farming systems research (3) special program research (which used to be NRM). The latter program encompasses soil fertility, land resources evaluation, agro-forestry, irrigation and mechanization. 1, 2, 3 are in all institutions but focus differs.
- Crop directorate has 4 departments: 1) Crop promotion, 2) Extension Services, 3) Plant health, and 4) ...? Promotion and extension services are relevant for TAMASA, as they are responsible for technology dissemination. **Yet, there is also an extension dept. a director for extension in MoA.**
- Extension is thus part of DRD, MoA, but local-level extension workers are employed by the ministry of local government. There are generally 20-30 extension workers per district, but there is often not an extension in a village. At wards level they are usually there.

**Discussion**
- Agric. sector programme, phase 2 (starts in July): needs to be informed of TAMASA
- Capacity building concerns: Soil scientists: 5 in Uyole, 3 at Selian, but half of them will retire in 2017. 20 PhD and 40 MSc are currently being trained, availability is an issue.
- Need to present TAMASA to ministerial mgt. team in DSM.
- There is is already an MoU between CIMMYT and MoA, so additional MoU (with DRD) may not be needed
- Strong need for capacity building – training.

**To be incorporated in 2016 workplan of TAMASA (Dr K. Masuki)**
- Present TAMASA to ministerial mgt. team (IMPORTANT!) – May? Zingore in TZ 16 May?
- Present TAMASA to agric. sector programme (When? In July?)

- Training in NE tool use [phone app] (by Jairos; Jens present?) to local-level extension workers and ARI researchers in TAMASA FA’s. Timing (June?) + participants to be planned with DRD+Mlingano in meeting. Training programme for PhD and MSc level researchers (tool hosting, database analytics) needs to be specified.
## Participants List

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References to additional documents
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