Taking Maize Agronomy to Scale in Africa (TAMASA Project)

Proceedings of the Annual Review and Planning Meeting 13-15 October, 2015, Sandralia Hotel, Abuja, Nigeria

Editor: Ibrahim Mohammed

Contents

Executive Summary

Taking Maize Agronomy to Scale in Africa (TAMASA) is a four-year Bill and Melinda Gates funded project been implemented by CIMMYT, IPNI, IITA, and AFSIS in Ethiopia, Nigeria and Tanzania with active participation of farmers, community base organizations, extension workers, policy makers and researchers. The project aims to improve agronomic and delivery services to farmers in maize based farming system in sub Saharan Africa. The objectives of the project are to close attainable maize yield gap through the following approaches; use of modern large data and analytics to map maize areas, soil constraints and attainable yield at different scale and in near real-time; develop open-access databases of soil and agronomic data to share information; co-generate with partners decision-support tools for nutrient and crop management and business-related service for agronomy researchers, service providers, industry and policy-makers and increase capacity in national programs and partners through in-country data science and software application training to support these approaches.

The first TAMASA annual review and planning meeting was held at Sandralia Hotel in Abuja, Nigeria from 13 to 15th October 2015. The objectives of the meeting were to review project activities and share experiences in Ethiopia, Nigeria and Tanzania since inception in May 2015; to understand and improve project methodologies, including data management requirements, to define capacity development plans for each country; and to address challenges and identify opportunities for effective project implementation.

The expectations of the meeting were to enable the participants have common understanding of TAMASA project which will enable them to develop integrated work plans for 2016 activities, to develop synergies and partnerships that can increase the impact of maize agronomy at scale.

The meeting was structured to include presentations, break-out sessions, and plenary discussions to capture progress, challenges, future opportunities and the way forward to help achieve up to 75% maize yield increase at the end of Phase-I of the project in the core-maize belts of the participating countries.

The meeting proceedings followed the TAMASA work-stream structure. On day-1, the presentations included overview of TAMASA project and country updates from Ethiopia, Nigeria and Tanzania. This was followed by review of work-stream 1.1 which included yield and soil survey and agronomic panel survey. On the second day, the morning presentations focused on the review of work-stream 1.2 which included review of Nutrient Omission Trials (NOTs)/NE tool Variety Tool (VT) and other use cases. In the afternoon, the focus was on work-stream 2.1 in which econometrics and socio-econometrics/geospatial econometrics were discussed. Other issues covered were review on knowledge, attitude and practices study in Tanzania. On the third day of the meeting, the morning session focused on work-streams 2.1 which dealt capacity development for the data management as well as and data sources and initiatives. During the afternoon session, the discussion was on work-stream 1.3 which included opportunities for scaling out with partners and collaborators with focus on Nigeria. Finally the session ended up with core-TAMASA team meeting in which reporting and future TAMASA meeting as well as AOBs relating to other important issues relating to the project were discussed.

The session also marked the active participation of the project Scientists, Collaborators and partners that were involved in questions, comments and observations which allowed further understanding of the project missions and strategies for implementation of the key activities. Further, the expectations were clearly understood for better implementation of the project in the three countries.

In his closing remarks, Dr. Peter Craufurd thanked Ibrahim Mohammed, the Country Coordinator for TAMASA Nigeria and Helen Princess as well as IITA for organizing and participants' commitments toward their active participation during the planning meeting. On his part, Dr. Alpha Kamara commended the TAMASA Scientists for their keen interests in the progress of the TAMASA project as well for their active participation in the planning meeting and hoped they enjoyed the stay in Nigeria while wishing them safe trip to their various destinations. Finally, the Country Coordinator for TAMASA Nigeria thanked all the participants as well as other support staff from IITA Ibadan that have contributed in one way or other toward the first annual TAMASA planning meeting and success.

Ibrahim Mohammed
Country Coordinator

Project Overview, Background and Milestones

by

Peter Craufurd (CIMMYT, Nairobi)

Background

- TAMASA is a BMGF supported project
- Started November 2014; duration is 4 years
- Core geography is maize-based systems
- Focus is small-holder farmers, service providers & industry supporting them

TAMASA Main Objectives

- Use modern large data & analytics to:

✓ map maize areas, soil constraints & attainable yields at different scales & in near real-time;

✓ develop open-access databases of soil and agronomic data to share information

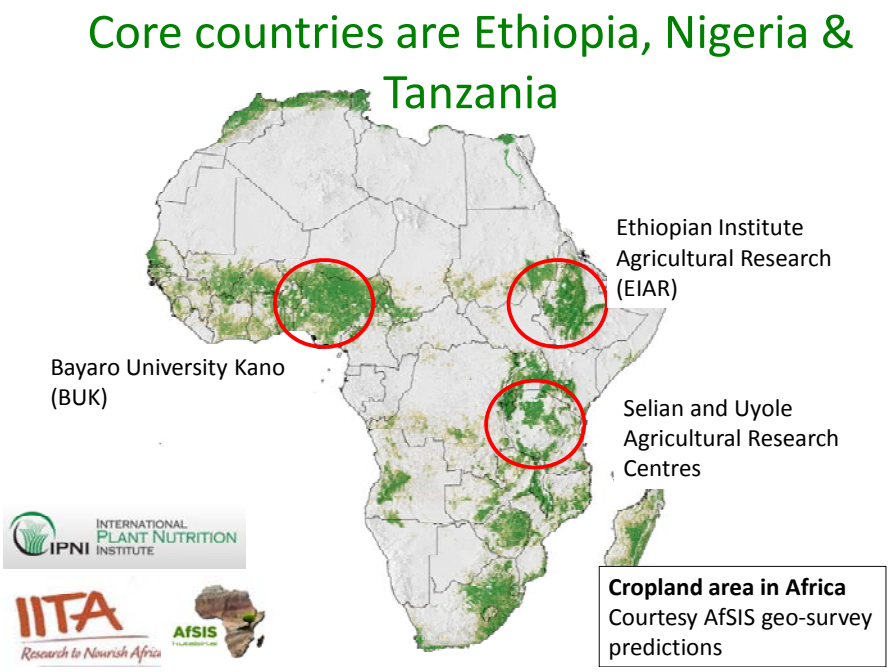
✓ Shared objective with AfSIS

- Co-generate with partners decision-support tools for:

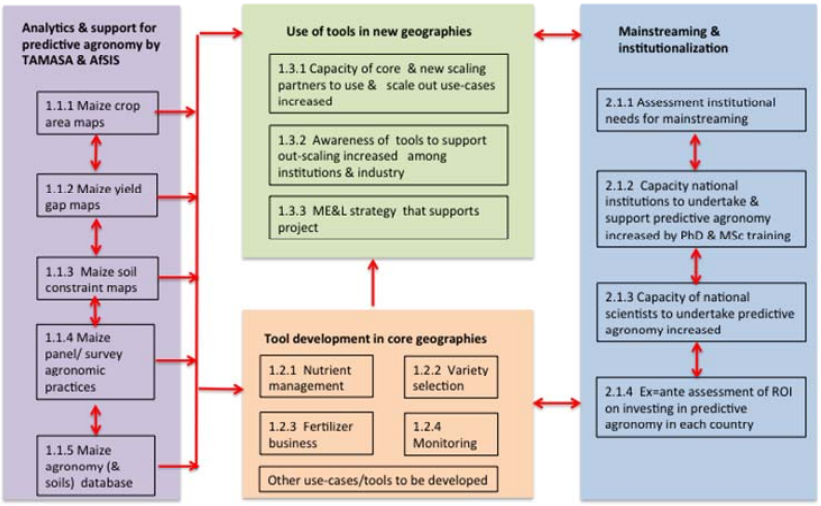
✓ maps, fertilizer/nutrient management & blending, crop management for different stakeholders;

✓ out-scale tools with new partners in new geographies

✓ Increase capacity in national programs & partners, including post-graduate training, to support these approaches



Four WorkStreams



Why TAMASA?
Objectives & Outcomes of the meeting

Why TAMASA?
Original title was:
Transformation of agronomic research and delivery services for smallholder farmers in maize-based systems in Eastern and Southern Africa.

Why TAMASA? Context

- BMGF wants to better understand constraints to fertilizer use & how to serve small farmers better.
- BMGF wants to use outputs from existing investments in soils (AfSIS) & maize breeding at scale to raise small-holder farm yields

So TAMASA needs to:

- To generate evidence that will change the way industry, NARES & CSOs invest in & implement agronomy at scale

Why TAMASA? Guidelines

- Use a systematic approach for development, calibration (parameterisation) & validation of 'use-cases'
- Show how calibration & validation of 'use-cases' fits within a geospatial framework (including other data layers) such that tools & recommendations are applicable spatially (i.e.

across the region of interest)

- Develop hypotheses & implementation plans that test these assumptions

Why TAMASA? More focus on ROI

Measure rates of return on investments (ROI) of 'use-cases'.

- *For farmers & service providers*
- What are the costs, risks & profits to farmers of using recommendations?
- *For industry & other investors*
- What are the costs & returns from investing in blending (soil mapping) & agronomy at large scale (regions of interest to nationally)
- *For policy makers*
- Generate & share evidence to influence policies around agronomy (fertilizer); encourage investment in geospatial & 'use-case' capacity

Objectives of the Meeting

- To review project activities and share experiences in Ethiopia, Nigeria, and Tanzania since inception in May 2015;
- To understand and improve project methodologies, including data management requirements;
- To define capacity development plans for each country;
- To address challenges and identify opportunities for effective project implementation.

Outcomes of the Meeting

Participants:

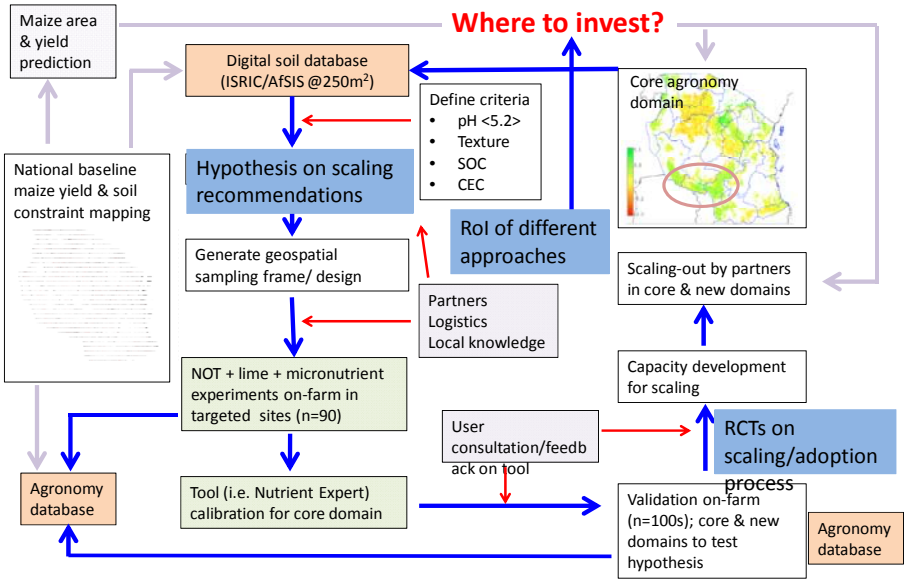
- Have a common understanding of how TAMASA contributes to the BMGF strategy for maize & soil fertility;
- Have a common understanding of TAMASA Outputs & can develop integrated workplans for 2016 (by 26 Oct);
- Develop synergies & partnerships to take maize agronomy to scale (focus on Nigeria).

Question

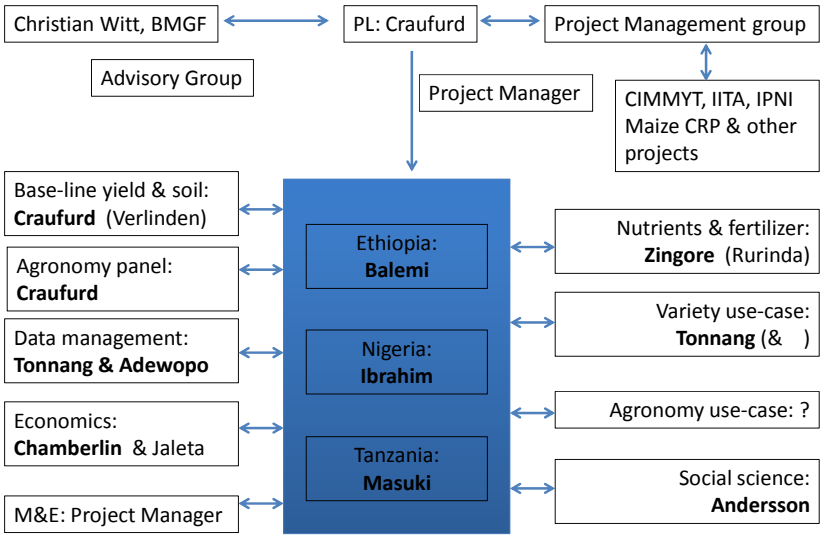
TAMASA Theory of Change (i)

- newly emerging data streams across scales from remote-sensing, crowd-sourcing and other sources, supported by modern analytics and APIs, and linked to a participatory co-development process with users, will result in improvements in agronomy at scale leading to household maize yield and production increases.

Soil mapping-soil fertility framework



Who is responsible for what?



Progress on Country Update

by

Tesfaye Balemi, Country Project Coordinator-Ethiopia

Highlight of TAMASA activities in Ethiopia

Ethiopia is characterized by high variability of maize yield

West Shoa Zone (Oromiya)

Districts	Productivity y (Q/ha)
Bako Tibe	62.3
Nono	50.5
Toke Kutaye	48.0
Dano	44.1
Ambo	29.8
Illu gelan	27.8

Souce: Zonal BoA, West shoa

Sidama Zone SNNP)

Districts	Productive
Boricha	80.0
Hadiya Zuria	79.0
Lo/Abaya	65.0
Aroresa	50.0
Bursa	45.0
Goriche	38.0

Source: Zonal BoA, Sidama zone

Sources of variability

- Poor soil fertility management/nutrient deficiency
- Inappropriate variety
- Poor crop management (weed, diseases, pests)
- Socio-economic factors
- Other factors (moisture stress, climate change effects)

TAMASA-Project

What did we plan for 2015

Outcome-1	Activities	Deliverables/milestones	Responsibility
New geo-spatial knowledge products and tools are used by TAMASA, AfSIS and other users to improve maize agronomy at scale	**1.1** Maize Crop Area Mapping	1000 georeferenced maize fields (National level)	EIAR assigned staff
	1.2 Maize yield gap Mapping	Grain yields of 1000 maize fields (National level)	EIAR assigned staff
	1.3 Maize soil constraints Mapping	Soil samples collected from 1000 maize fields, processed and analysed (National level)	EIAR assigned staff
	1.4 Maize Panel Survey of Agronomic practices	Panel survey data from 100 households in 10km X 10km grid collected (Bako & Hawassa)	EIAR assigned staff
	1.5 Establishing Nutrient Omission Trials	47 NOT established and managed to high standard, 47 pre-planting soil samples collected, processed and analysed	EIAR assigned staff
	1.6 Developing Agronomic & soil databases	All data (1.2-1.4) collected and entered into database	Responsible person to be assigned by EIAR

What was done so far?

1. Partnership Established

- MoU signed between CIMMYT & EIAR
- Nomination of national Coordinator of the project-EIAR side
- Nomination of Focal persons for each region (Bako, Jimma, Melkasa)

National Coordinator	Focal Person-Anmo	Focal Person-Jimma
		

2. Training on NOT establishment and management (April, 2015)

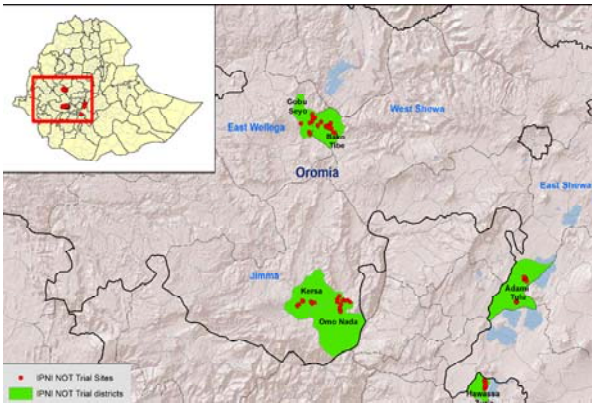
Training (DAS) - BAKO

DAs trained on establishment and management of Nutrient Omission Trials at Bako

Practical session at Bako-lay outing

3. Establishing multi-location nutrient omission trials (Early May-Early June, 2015)

- 24 fields at Jimma area (Omo
- Nada & Kersa districts)



Field layouting and planting

Planting date

- at Jimma (06/05/2015 to 16/05/2015)-early
- At Bako (29/05/2015 to 4/06/2015)-late

Variety used:

- BH-661

Who were involved?

- CIMMYT-staff + 2 Researchers (EIAR) + 2 Das/kebele + 4-5 Daily workers

4. Follow up of the trials through periodic visit

We were periodically visiting the trails (for better weed management, disease and pest monitoring)

Purplish colouration and stunted growth observed in P omitted plot at Jimma

Yellowish colouration and stunted growth observed in control & N omitted plot at Jimma

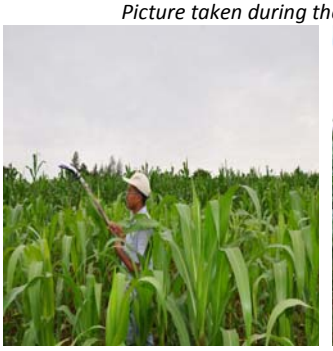
The 2nd N top dressing was made both at Jimma (19-20/July/2015) and Bako (24-25/July/2015)

Picture taken during the 2nd N top dressing

Status of the NOT

- >90% of the field trials were well managed
- 1st N top dressing were made both at Jimma (25-26/June/2015) and Bako (2-3/July/2015)

Picture taken during the first N top dressing



All the necessary data were collected

- Planting date
- N topdressing dates
- Weeding date
- NDVI reading
- Plant height (at tasselling)
- Leaf number (at tasselling)
- Days to 75% tassling
- Days to 75% silking,

Data at harvest: Yet to be collected

Problems observed on NOT

- Lack of technical competency of DAs to establish and handle trials themselves
- Lack of commitment of some DAs for proper trial follow up (most well managed few weed infested)
- Most farmers were not willing to thin the extra crop stands themselves
- Farmers were not willing to manage weeds as required
- Some farmers are not willing to accept the first two plots, unless compensated

Marawa/Jimma

Kitim Bile/Jimma

6. EIAR-CIMMYT activity planning & awareness creation meeting conducted (10 July 2015)

- Land and water resource directorate office
- National coordinator
- Focal persons at each research centres
- Centre directors of each relevant research centres

7. Panel Survey of Agronomic Practices (Bako) done

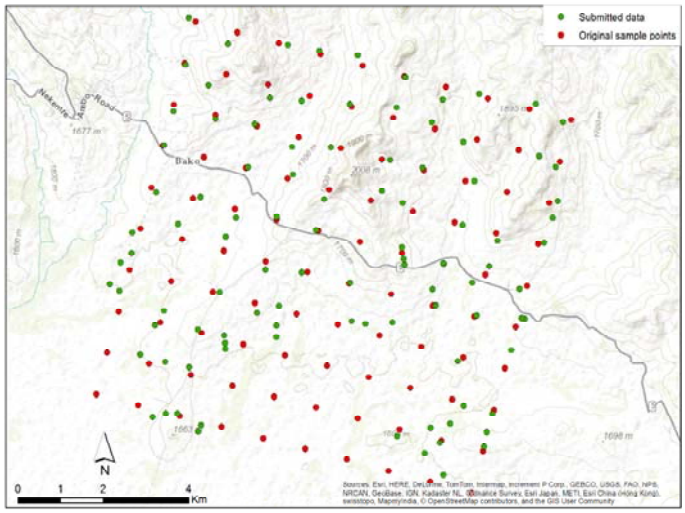
- Vegetative stage
- Flowering stage

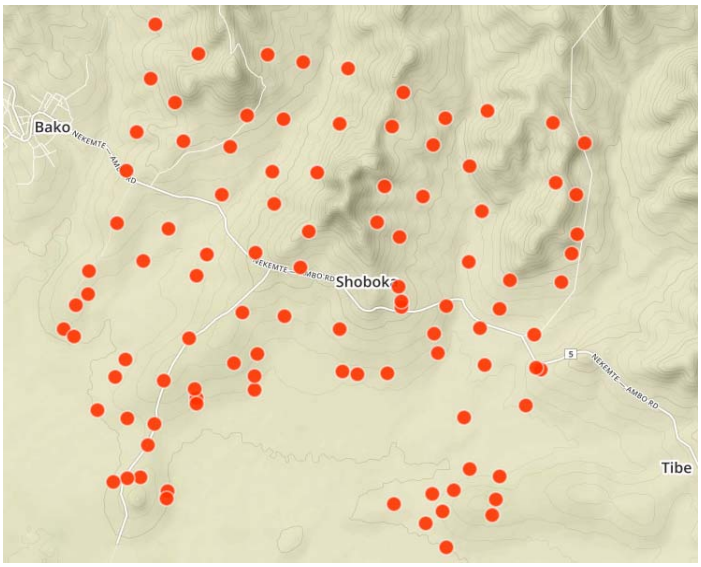
Training was given to the survey team

Survey team being trained on

- How to use ODK
- How to use GPS essential to navigate closer to sampling point

Survey team interviewing a widow farmer

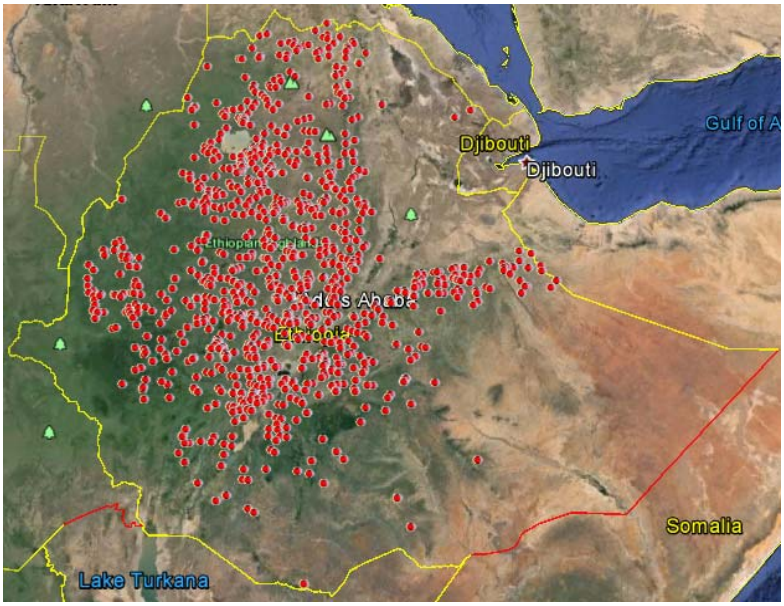




Agronomic panel survey sampling points

8. Baseline survey (yield and soil sampling)

- 1000 points (national level)



Training of Trainers given to EIAR and CSA staff (9-10, October, 2015)

CSA staff on training



EIAR staff on training



- **Sampling (yield & soil) to take place in the coming few weeks following training of enumerators**

What we expect soon

- EIAR will fully overtake the whole TAMASA activities ahead of us
- Do harvesting of NOT
- Do harvesting stage of panel survey
- Yield and soil sampling from at least 700 points during the current crop season (CSA + EIAR)

Challenges

- Delay in establishment of agreement between EIAR & CIMMYT
- Delay of RA recruitment
- Problem of storage and lab. facilities

Clear treatment effect of nutrients observed at most of the NOT sites


Progress on Country Update Nigeria

by

Ibrahim Baba Mohammed, Country Coordinator-Nigeria (IITA)

The Vision of TAMASA Project

TAMASA is a BMGF supported project whose **vision** is to Transform agronomic research and delivery services for smallholder farmers in maize-based systems of Sub-Saharan Africa.

Objective

The objective of TAMASA is to close 'attainable yield gaps' and raise maize productivity using innovative approaches that:

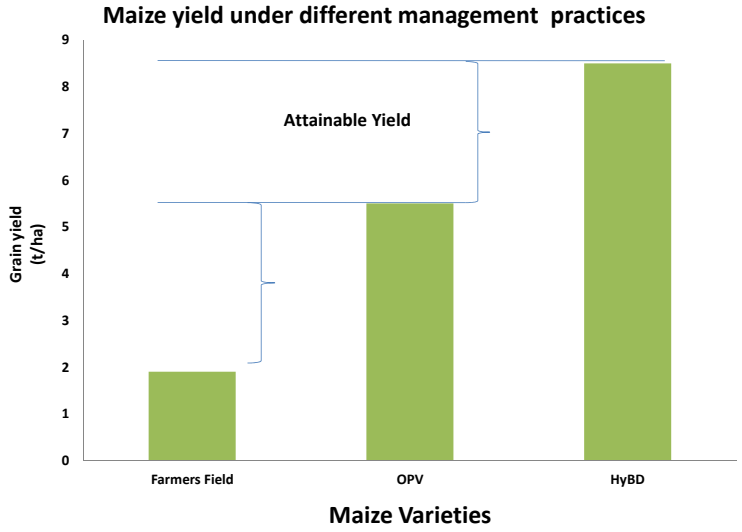
- use modern large data and analytics to map maize areas, soil constraints and attainable yields at different scales and in near real-time;
- co-generate with partners decision-support tools for nutrient and crop management, and business-related locational services for agronomy researchers, service providers, industry and policy-makers;
- generate open-access databases of soil and agronomic data;
- increase capacity in national programs and partners through in-country data science and software application training to support these approaches.

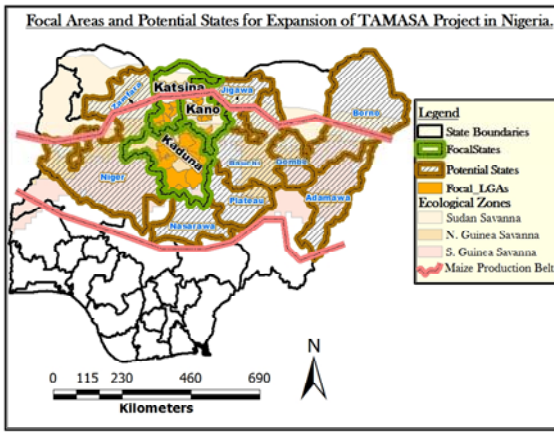
Maize Production and Opportunities for Closing Yield Gap in Nigeria

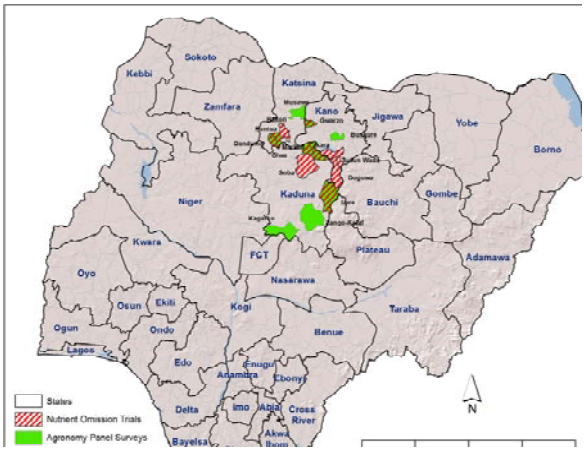
In Nigeria maize is an important staple food and feed crop. The crop is mainly grown by the smallholder farmers with **yields lower than those obtainable** using improved technologies.

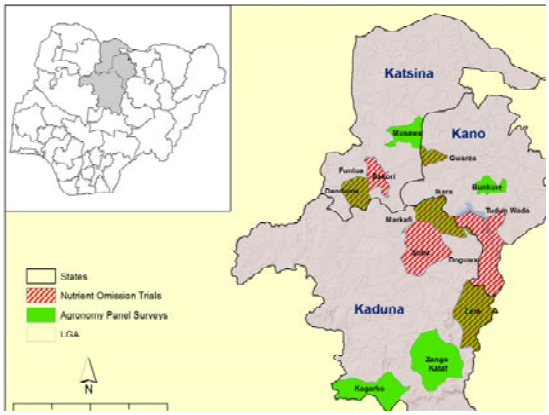
Studies have shown that opportunities are available to **close this 'attainable yield gap'** through adoption of appropriate technologies that include use of improved seeds, cropping systems, soil fertility management strategies, soil and land management practices, supported by effective extension delivery systems, marketing and credit systems and appropriate government policies.

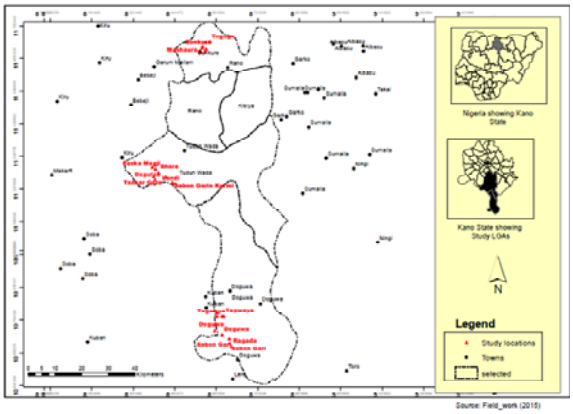
In Nigeria maize yields under the smallholding which range between **1.5 and 1.9t/ha can be raised from 4 to 8.5t/ha (hybrid) and 3 to 5.5t/ha (OPV)** using improved technologies.

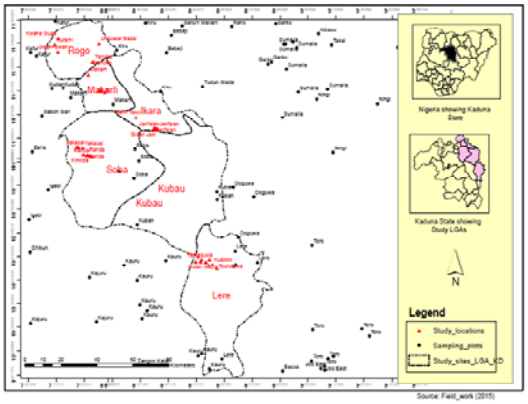


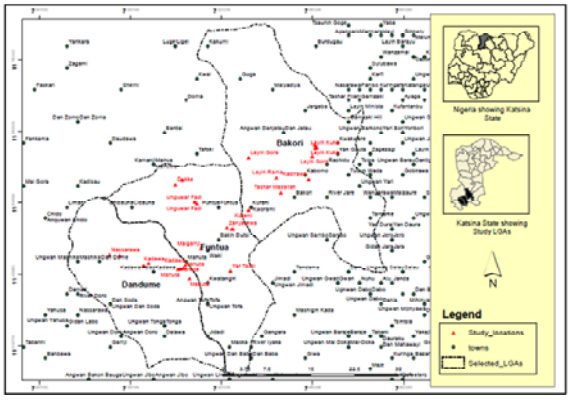












Expected Outcomes

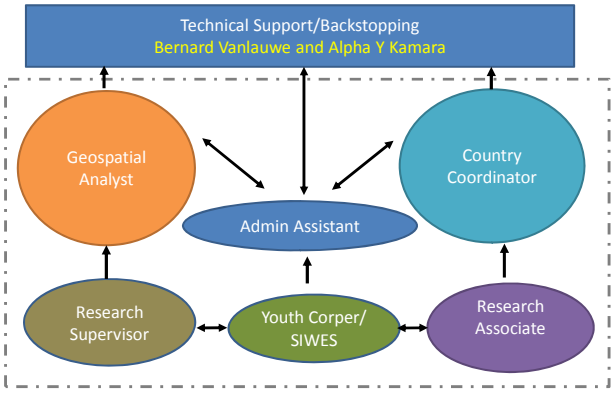
- The expected intermediate outcome will be an <u>increased use of appropriate inputs by smallholder farmers</u>, supported by strong, local investment cases based on the integration and analysis of geospatial, econometric and risk data.
- The overall outcome will be <u>an increase in smallholder maize yields</u> with concomitant benefits to food security and livelihoods. Input suppliers and agro-dealers businesses should also benefit.

Activities and Progress so far

1. Hiring of key project staff

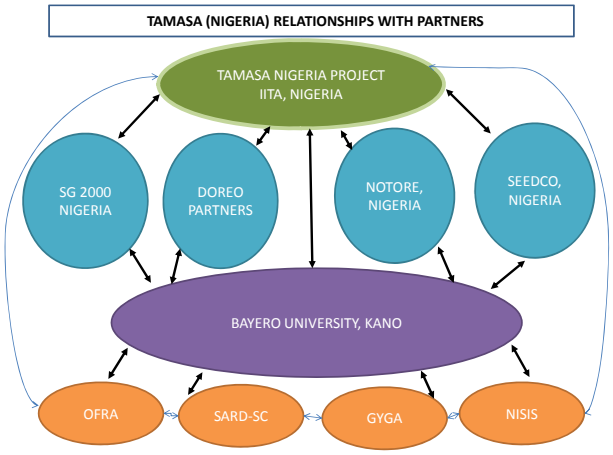
- Project Country Coordinator
- Geospatial Analyst
- Admin Assistant
- Research Associate
- Research Supervisor
- Support services (pending)
  - ✓ One Youth Corper
  - ✓ One SIWES

Organizational Chart



2. Partnerships: So far the project has established partnerships with following partners:

S/N	Institution	Geography and Area of Specialization
1	Bayero University, Kano	Kano; teaching and research
2	SG2000 Nigeria, Kano	Kano, Kaduna & Katsina; Extension services
3	Notore Nigeria	The whole country; fertilize blending/business
4	Doreo Partners Nigeria	Kaduna; extension services
5	Seedco Nigeria	Maize growing areas; seed business



3. Creating awareness on the project through planning meetings and workshops with partners and stake holders within and outside the country:

- Project launch in Addis Abba Ethiopia
- Planning meeting in Ibadan
- Nutrient Expert appreciation for our partners in Abuja
- Meeting to develop project work plan in Kenya
- Action points review and planning meeting on BUK activities – NOT, Baseline and harvest survey

Table 1: Potential TAMASA Partners in Nigeria

S/N	Research/Extension/Dev Agencies	Seed Agencies	Fertilizer Companies
1	ADPs	MASALAHA Seed	Diamond Fertilizers
2	IAR, ABU, Zaria	Maina Seed	Golden Fertilizers
3	Commercial Agriculture Development Project	Techni Seed	Elephant Fertilizers
4	USAID-Markets	De-All Green Seed	States Governments Fertilizer Blending Companies and Agencies
5	National Maize Farmers Association of Nigeria	Seed Project	
6	ATA	Premier Seed	
7		Syngenta	

4. Partners appreciation of the concept of the use cases (Demand driven) and identification / development of appropriate TAMASA tools for maize yield increase in Nigeria, which include:

- fertilizer recommendation tool,
- variety tool, and
- fertilizer blending tool for industry

5. Capacity building:

- Three PhD candidates from the Bayero University, Kano are currently in Leuven, Belgium pursuing PhD programs in predictive agronomy and geo-spatial science.
- Another candidate from Ahmadu Bello University, Zaria is also in K. U. Leuven for a PhD program in socio-economics.
- Two MSc students of Bayero University, Kano, Nigeria, are currently evaluating maize response to micro- nutrients (Bo, Zn, Mg and Fe)

6. Preparation for Geospatial Data Acquisition

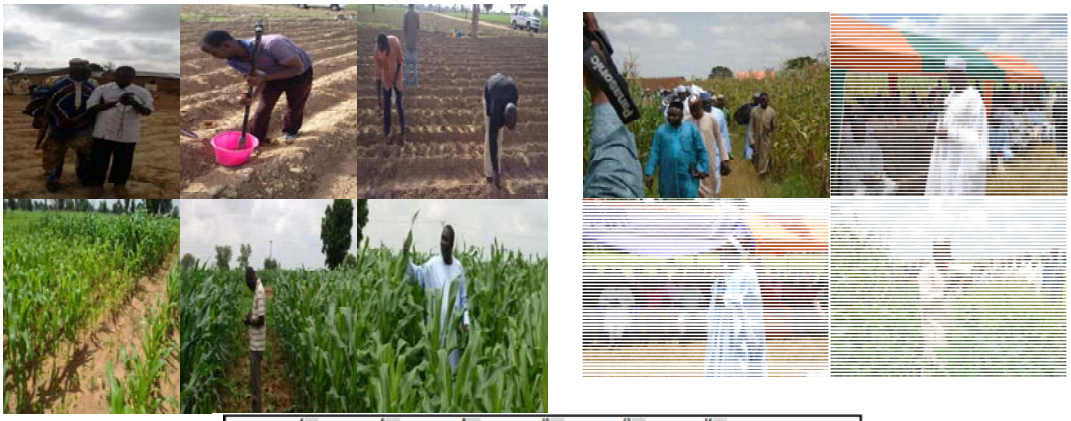
Activity	Goal	Outcome
Reconnaissance Survey of NOT Sites	• To acquaint the recruited Geospatial Analyst (GA) with TAMASA NOT locations • Enable GA to assess site conditions for geospatial data collection	• Average of 4 NOT locations per LGA visited within TAMASA Core Geographies; • Action points noted for geospatial representation of trial plots.
ODK/GPS Training	Introduce project stakeholders to TAMASA goals and train them on the application of geospatial and survey tools for project implementation	• ~25 Extension Agents and data enumerators trained to use smartphone-based tools for data collection. • Pre- and post-training test scores showed that knowledge of the participants improved by an average of ~70%.

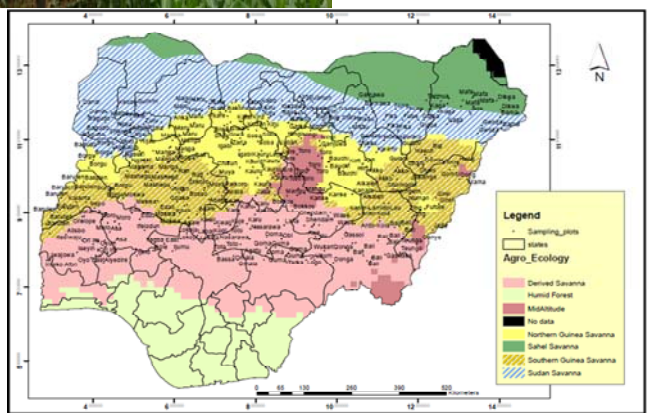
Training/Workshop Conducted by the Project

- The project has (in conjunction with ICRISAT) conducted training on systems modeling for some staff of IITA, Kano and Postgraduate students of BUK
- Training of Extension Agents and Technicians on quality data collection
- The project has conducted workshop/training on the use ODK and GPS in Baseline and Harvest survey for Extension Agents, Bayero University and IITA staff.

7. Establishment of NOTs and conduct of Panel / Baseline survey by BUK

- Ninety five (95) Nutrient Omission Trial Fields (NOTs) have established in the focal states to evaluate maize yields nutrient response for Hybrid and OPV
- Panel surveys in 100 sites across the focal states have been established
    - Pre-sowing, Vegetative, flowering, harvesting and post harvesting
    - Lere, Ikara, Makarfi, Kagarko, Z/Kataf, Dandume Funtua, Kankara, Bkre, G/Mal.
- Sixteen (16) maize varieties are being evaluated to generate cultivar coefficients for calibrating CERES-Maize model
- Baseline final yield and soil survey
    - To measure yield and assess soil constraints in a 500 spatial survey of maize fields
    - To produce a more accurate map of maize areas in each country
    - To improve predictions of maize yields
    - To identify spatial soil constraints.





8. Acquisition of A project vehicle and Drone

- A brand new Toyota Hilux has been acquired to project activities.
- Procurement of a UAV is at advanced stage. It will assist the project in collecting geospatial data.

Challenges

General Observations

- Early constraints faced include late onset of rains in the 2015 season
- In August, some sites could not be easily accessed due to excessive rainfall and poor roads
- 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
- Engaging Partners for Nutrient Expert tool appreciation

Future Plans

- Conduct of Stakeholders meeting to explain the proposed TAMASA tools to end-users
- Reaching out to potential partners and collaborators
- Reaching out to new geographies
- Establishment of a database for geospatial, agronomic and socioeconomic information on maize for the project, partners and other end users.

Progress on Country Update: Tanzania

by

Kenneth Masuki, CIMMYT, Tanzania

Activities done since February 2015

- Knowledge Network Analysis (KNA) workshops
  - ✓ Conducted in Northern Zone, Arusha region, Karatu district and Southern Highlands Zone, Mbeya, Mbozi district – More to be presented
- Visiting Potential Partners and Profiling
  - ✓ Research Institutions – ARI-UYOLE, SARI, ARI-Mlingano
  - ✓ District Councils – Karatu and Mbozi
  - ✓ Fertilizer Companies – YARA, Minjingu Mines
  - ✓ Seed Companies – Meru Agro, Seed Co, Highland Seed, MAMS, TOSCI
  - ✓ NGOs – OAF, AFAP

Inventory of Partners and Roles

Partner	FRT	FBT	VT	MI
IPNI	Y	Y		
Minjingu Mines and Fertilizer Co.	Y	Y		
Farm Input Promotions Africa (FIPS-Africa)	Y	Y	Y	Y
YARA Fertilizer Company	Y	Y		
TFRA	Y	Y		
African Fertilizer and Agribusiness Partnership (AFAP)	Y	Y	Y	Y
MAFSC-INPUT Delivery	Y		Y	Y
MAFSC-Statistic Department	Y	Y	Y	Y
MAFSC-Policy Department			Y	Y
NARLs (SARI, ARI-Uyole and ARI-Mlingano)	y	y	Y	Y
SUA	Y	Y	Y	Y
AGRA-Soil Health	Y	Y		
AGRA-PASS and NEW initiative SSTP (Scaling Seeds and Technologies Partnerships)			Y	y
AFSIS/TANSIS	Y	Y	Y	Y
Tanzania Meteorological Agency (TMA)	Y	Y	Y	
Seed Companies (MERU AGRO, PANNAR, MAMS, SeedCo, Kibo Seed, IFA Seed, Suba Agro, Pioneer, EASeed, AMINATA Quality Seed etc)	Y	Y	Y	Y
Tanzania Official Seed Certification Institute (TOSCI)			Y	Y
Agricultural Seed Agency (ASA)			Y	Y
Building Rural Incomes Through Enterprise (BRITEN)	Y	Y	Y	Y
Local Government (Karatu and Mbozi)	Y	Y	Y	Y
Other CGIARs – IITA, BeCA, etc			Y	
TechnoServe	Y	Y		Y

Baseline Yield and Soil Survey

Survey based on 1000 randomly generated points within cropland

More than 160 sites were surveyed between June and September 2015

- 123 in SHZ and 45 in EZ and NZ

4 PhD Candidates Identified

- **Wageningen University**

✓ "Sustainable intensification in Tanzania: towards a better understanding spatial variability of input responses to reduce farmer's risks"

✓ "When farming becomes a risky business for smallholders: how is risk influencing farmer decisions in Tanzania?"

- **Reading University**

✓ *"Combining multiple streams of environmental data into a soil moisture dataset for maize-based systems in Sub-Saharan Africa"*

✓ *"Combining multiple streams of environmental data into a decision support tool for maize-based systems in Sub-Saharan Africa"*

Lessons learnt from Tanzania

- It is sometimes difficult to get to the exact geo-point. Each sampling point basically represents a pixel or sampling area of 250 m by 250 m (6.25 ha).
- AFSIS is developing tools to ensure accuracy in data collection
- Sampling per se takes between 45 and 75 minutes
- Most time is spent on traveling and tracing the point
    - The terrain make it difficult to juggle around the bush
- Experience show that a single team (three people) can sample about three samples a day in Tanzania.
    - This makes the exercise more costly
- The yield baseline survey could be easy and more meaningful if done in 10 km by 10 km grids
- Recent experience shows that a team of 3 can take 3 days to sample such a grid which is about 50 samples

Challenges

Key Issues to Consider

- This exercise is geared towards developing maps of maize growing areas and determine spatial soil characteristics (constraints) that influence yield
- Its value for money may not be seen now but it is for future food security planning at national level
- The data we collect now is the right data but we may need to add more data that influence soil characteristics e.g. slope

- Slope influent soil fertility gradient on a landscape

- Experience in Tanzania shows that to get good and reliable data this exercise has to be done by research personnel
- Use extension or development partners may not necessarily reduce costs rather increase data unreliability
- This exercise needs to be repeated due to bad year effect on yield, however may need more sampling in a unit area e.g. use of 10 km by 10 km grids
- Planning a panel survey may add value to the data collected

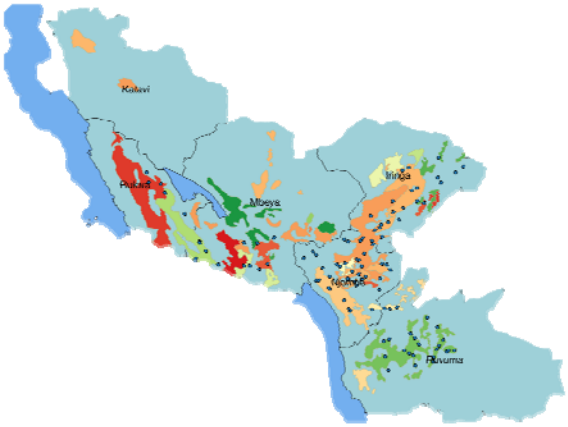
Nutrient Omission Trials

- NOT visit in Ethiopia
- NOT Planning meeting was held on 6th and 7th October 2015
- Attended by about 25 participants including
  - Research,
  - Extension and
  - Private sector actors

- Participants explored the NE tool
- Participants gave their views on the NE tool on how to improve it
- Some participants were asked to provide some initial data to configure NE tool for Tanzania by 23rd October

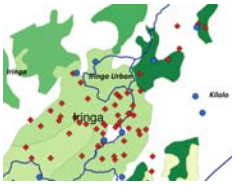
- NOT implementation strategy was developed to enable trials to roll over by November/December 2015.
- Plan to conduct 100 trials
- Site selection will be done based on pre-selected 10 km by 10 km grids to be developed by AFSIS after conducting a propensity analysis to determine representation of the site to the major maize growing area
- Region of Interest (ROI) is Southern Highlands Zone – Iringa, Mbeya, Rukwa and Ruvuma

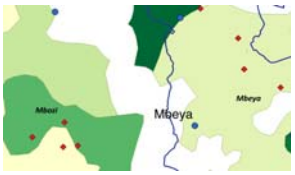
Nutrient Omission Trials – ROI



Apart from ARI-UYOLE, a major and important partner in ROI is **One Acre Fund**

- About 10,000 farm HH
- Plan to reach 20,000 fHH
- Interested to conduct NOT





Others include:

- District Councils,
- YARA and Minjingu Fertilizer Co.
- Meru Agro Seed Co

Next Steps and Plans

- Collect soil, fertilizers and crop data for configuring Version 0 of Nutrient Expert for Tanzania
- Implementation of NOT strategy
- Design Panel survey in southern highlands zone
- Plan to use AFSIS/TANSIS 10 km by 10 km grids
- Continue with yield baseline surveys in areas not done (From February 2016)
- Integrate PhD studies in TAMASA work as they develop their Concepts/Proposals
- Involve MSc students in some TAMASA activities e.g. Further studies on emerging issues in NOT

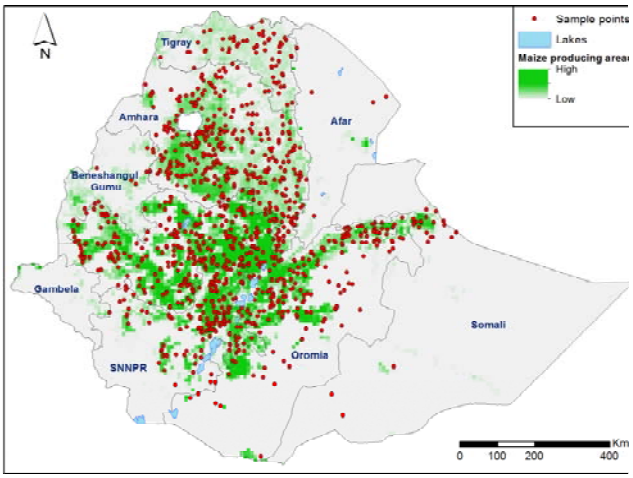
NOT Implementation Strategy

Activity	Time Frame	Responsible
Site selection		
• Random sampling	By 10th October	AFSIS
• Site verification	By 16th October	CIMMYT + IPNI
• Site identification	By 30th October	UYOLE, LG, CIMMYT
Training of Research Team		
• Identify the 5 research teams	By 16th October	UYOLE, LG
• Train on the protocols	By 3rd November	IPNI
Materials Preparation		
• Fertilizers (TSP, MoP and other sources))	By 2nd November	UYOLE
• Varieties selection	By 30th October	UYOLE, LG, IPNI, CIMMYT, Seed Co.
• Procurement of Seeds	By 2nd November	UYOLE, LG, Seed Co.
• Sampling bags	By 2nd November	UYOLE
• Rain gauges	By 2nd November	CIMMYT
Land Preparation		
• Tillage	By 12th November	UYOLE, CIMMYT
• Plot layout	By 13th November	UYOLE, CIMMYT
• Soil sampling	By 13th November	UYOLE, CIMMYT
• Install rain gauges	By 13th November	UYOLE, CIMMYT
• Prepare fertilizers	By 16th November	UYOLE, CIMMYT
• Planting (done in five days per site	By 30th December	UYOLE, CIMMYT

Baseline Yield & Soil Survey

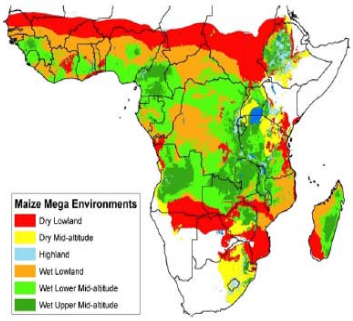
by

P. Craufurd (CIMMYT), K. Masuki (CIMMYT) & B. Vanlauwe (IITA)



Contents

- Objectives & Key questions
- Process & minimum dataset
- Data collected in TZ & lessons learnt
- Progress & plans in Ethiopia & Nigeria [35 mins]
- Three questions for group work[40 mins]

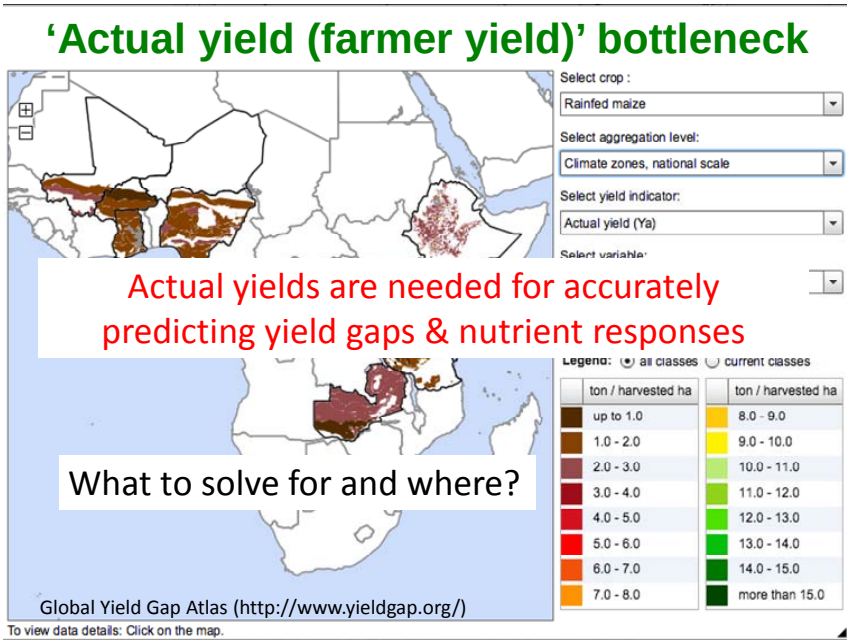


Aim:

To map maize areas & determine spatial soil characteristics (constraints) in each country

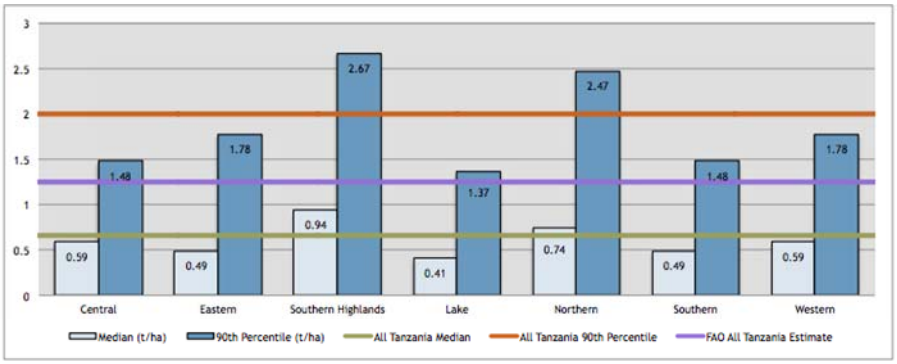
Outputs:

- More accurate assessments/estimates of
- maize (based system) areas in each country
- actual or farmer (Yf) maize yields
- soil nutrient constraints
- predicted attainable yields (Ya)
- Joint activity with AfSIS (soil analysis & predictions)



Actual Yield in Tanzania

Some data are available, but not linked to soils or other data useful for improving predictions; georeference is not always available



Tanzania National Panel Survey LSMS-ISA: Maize 2008

Key questions

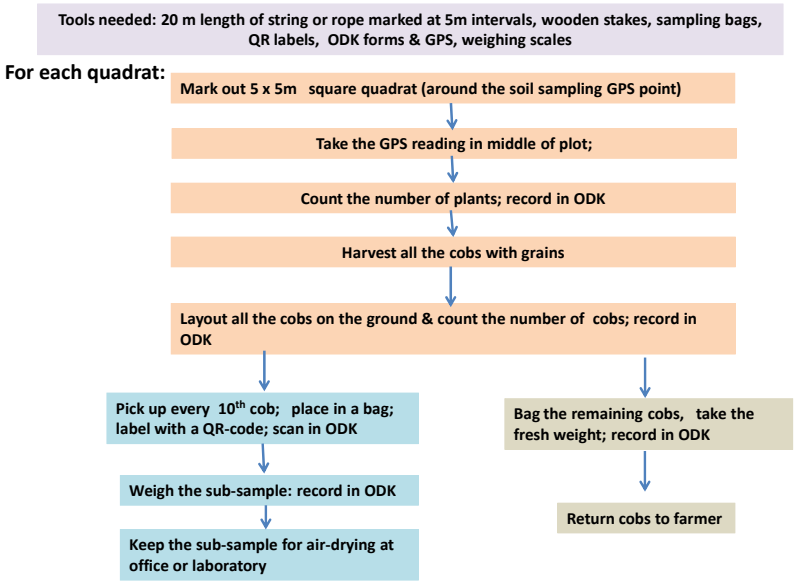
- Do we understand the purpose of this exercise? Is it value for money (viz our other priorities)?
- Are we collecting the right data? Are there additional agronomy/soil fertility questions we should ask viz other objectives?
- How can we decentralize this exercise/use other extension or development partners to reduce costs
- Do we only need to do this exercise once, or do we need to consider this as a panel survey?

Method:

- 1000 random points (pixels) within cropland area in each country were generated
- Sample as many as possible at maturity/harvest
- In each field, on 3 replicates:
  - Measure yield & count number plants and ears/cobs (crop-cut of $25m^2$)
  - Collect soil sample at 0-20 & 20-50 cm depth (using AfSIS protocols)

Question: how many samples are needed?

Workflow – Yield at harvest/maturity



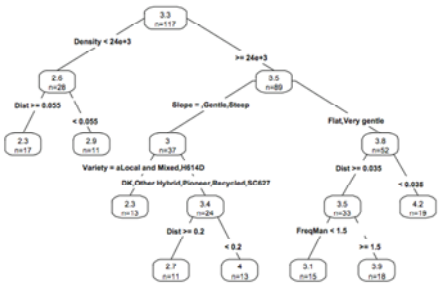
Minimum data set

- Geo-reference (each replicate)
- Field area (using mobile APP)
- Soil samples at 0-20 and 20-50 cm depth (to be analyzed by mid-IR)
- Name & type of maize variety
- Type (& quantity) of fertilizer applied
- Number of plants & number of cobs/ears
- Air dry weight of cobs/ears (subsample)

Other agronomic data?

Key variables:

- Slope
- Plant density
- Variety
- Distance from homestead
- No. years since fallow
- Timing of planting



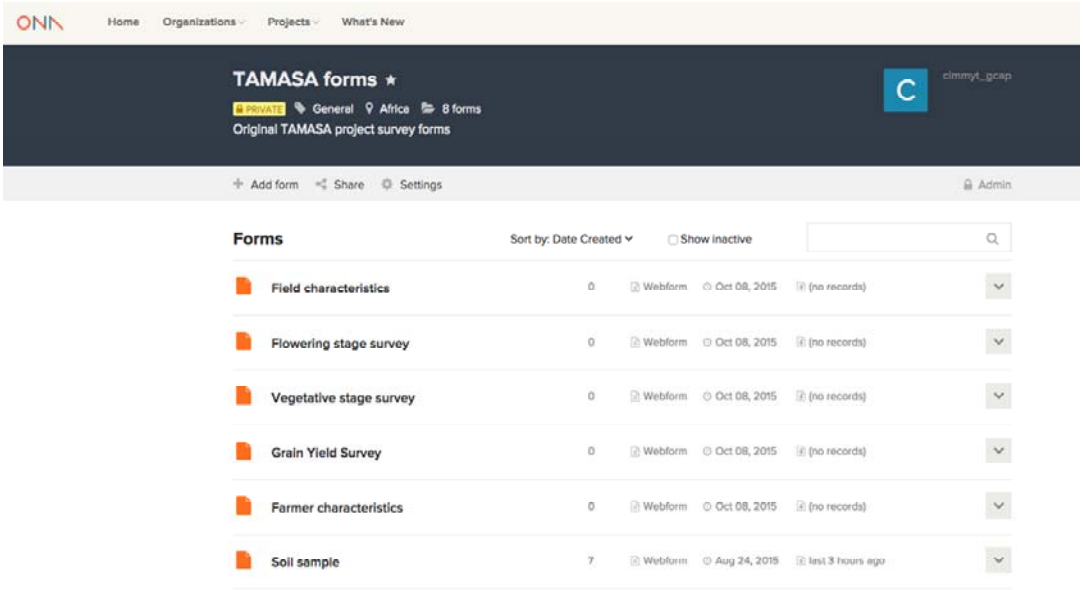
J. Kihara (2014) Agronomic survey to assess crop yield, controlling factors and management implications: a case-study of Babati in northern Tanzania. Nutr Cycl Ecosystems

GPS & ODK training

- Training in Tanzania (Uyole), Nigeria, Ethiopia
- GPS applications (UTM area measure, GPS essentials)
- ODK (developing forms & using ODK on mobiles)
- SOPs for baseline yield survey & soil sampling
  https://ona.io/cimmyt_g

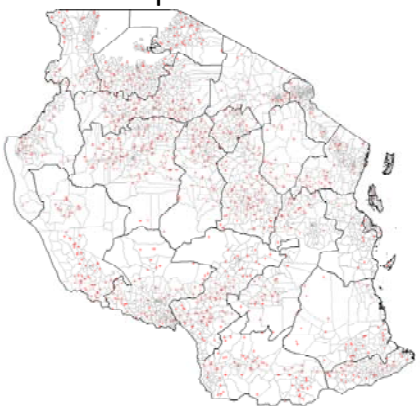
ODK for near real-time data collection

https://ona.io/cimmyt_gcap/

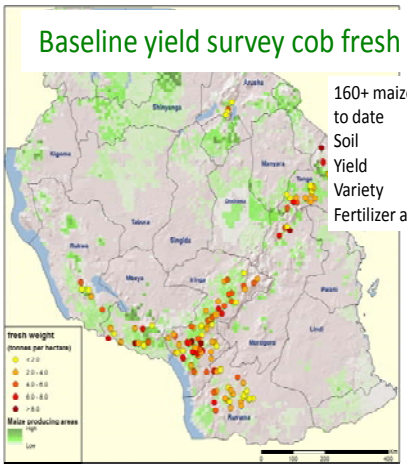


Progress in Tanzania
Mushongi, Lemeck, Masuki

1000 points in Tanzania

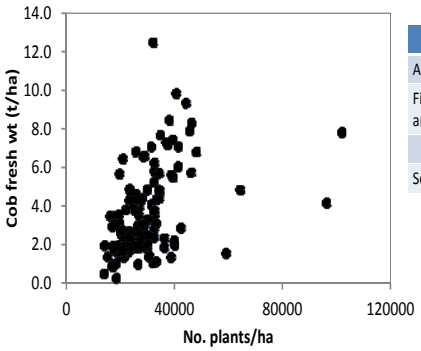


Baseline yield survey cob fresh weights



160+ maize fields sampled to date
Soil
Yield
Variety
Fertilizer applied

Plant density is a major limitation



	Mean	STD
Age	45.2	13.0
Field area	0.50	0,62
	M %	F %
Sex	71	29

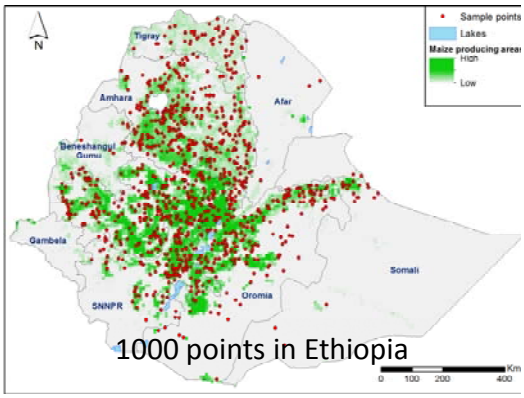
>95% sole maize

Measured yields from 123 fields in Southern Highlands Tanzania in 2015

Lessons learnt from Tanzania

- The window to measure yield is short
- It is not necessary to get to the exact geo-point. Each sampling point basically represents a pixel or sampling area of 1 km^2. The aim should be to get reasonably close to the designated sampling point, i.e. within 500m and where there is a maize field
- A single team (4+ driver) averaged about three to four samples a day in Tanzania. Two teams x 23 days = 126 samples. The average cost of a sample was therefore about $120 in Tanzania.

Progress in Ethiopia
Shimber & Balemi

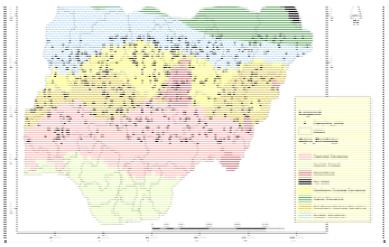


Proposed action plan

- EIAR/CIMMYT
- Regions, no. samples etc
- Central Statistical Agency (CSA)
  - Subcontract CSA to collect 500 samples in xx regions
  - In Ethiopia, CSA samples would cost about $17 each, (excluding training costs)

Progress in Nigeria
Prof. Jibrin M. Jibrin

500 points in Nigeria



Highlights:

- Training on ODK given to EAs, CDA & IITA staff
- Step down training to other staff of CDA by first set of trainees
- Survey just started after NOTs and PS harvest activities. Done by CDA staff and EAs

Challenges

- Lack of accessible road by vehicles in some areas
- Absence of farmer around the farm at the time of visit
- Some points fall in rivers or FADAMAs
- Problem uploading the filled ODK forms

Way Forward

- The activity is on-going
- National Agricultural Extension and Research Liaison Services (NAERLS) will assist in Niger State through its North Central Zonal Office
- Possibility of subcontracting NAERLS in subsequent seasons

Questions for Group Work

In table groups by country, please discuss the following questions, summarize on paper/flip-chart (bullet points) & report back

1. How can we reduce the costs of this exercise (while ensuring wide spatial coverage & quality control)?

- What are the options?
- Who are the partners?
- What training/capacity development is needed?
- What are the advantages & disadvantages?

2. What other agronomic/crop or socio-economic data should we collect as part of this survey? Additional data should add value to: (i) understanding variation in yield at spatially & (ii) scaling of use-cases

- What data or information?
- How obtained (survey question or measured/observed)?
- Justification?

3. Do we need to do this exercise once (i.e. in a single year?) or repeat it (for temporal variation, i.e. a Panel Survey; M&E?)

Highlight of Agronomic Panel Survey: Experience from Ethiopia & Nigeria

by

T. Balemi (CIMMYT, Ethiopia), P. Craufurd (CIMMYT, Nairobi), & J.M. Jibrin (Bayero University, Kano)

Objective:

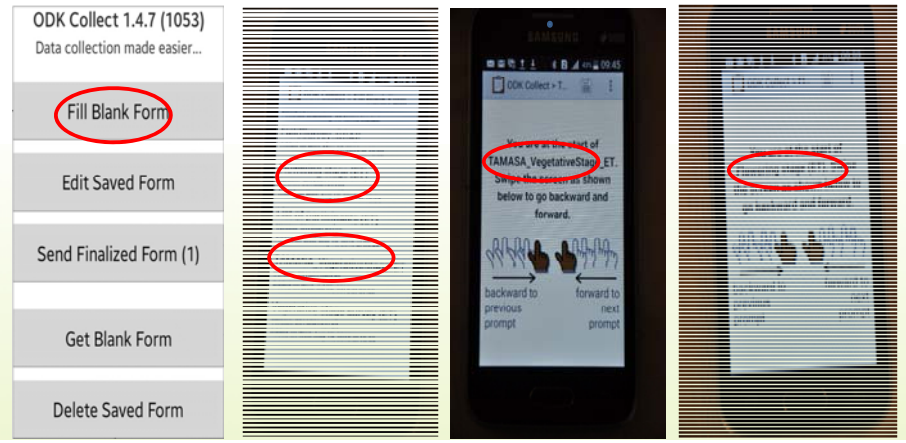
- To understand spatial and temporal variability in *field, farmers characteristics* and important *agronomic practices* influencing maize yields.

1. Experience from Ethiopia

How was data collected?

- Using ODK loaded on smartphones

ODK forms are found at https://ona.io/cimmyt_gcap/



Some of the parameters captured

- Farmer's Characteristics:
  - Farmer's name, Age, Sex, land ownership, Farm size, assets owned, distance to input and output market, whether trained about maize agronomy, level of trust for DAs
- Field Characteristics:
  - Farm distance to home, precursor crop, farm slope, soil type, soil colour
- Vegetative stage:
  - Maize cropping system, planting date, maize var. grown, land preparation method, type and amount of fertilizer (organic/inorganic), %weed cover, % disease and pest incidence, %residue cover, soil sample (0-20 cm), geo-references of the farm
- *Flowering stage*
  - Type and amount of fertilizer (organic/inorganic) applied, fertilizer application time, crop stand count, % weed cover, % disease and pest incidence, %residue cover, nutrient deficiency observed
- *Harvesting stage*
  - Number of crop stand/quadrant
  - Number of cobs/quadrant
  - Weight of cobs/quadrant

Limitations of the forms

For field characteristics

- Dominant soil type (clay, silty, clay loamy, sandy loam etc) difficult for enumerators to identify
- Crop currently grown on the farm (already known)

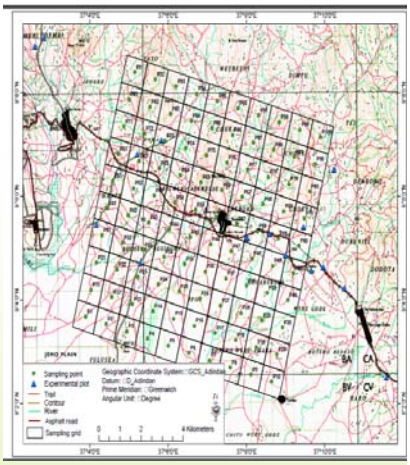
Flowering stage

- Redundant questions (Fertilizer application esp. organic, %crop residue cover)- *already captured at vegetative stage*
- Redundancy (field area)-*already captured at vegetative stage*
- Difference in the size of the quadrant between vegetative stage
- (4m X 4m) & flowering stage (5m X 5m)
- Disease severity not captured
- Method of disease and pest control not captured
- How frequent they control weed/at what stages/ control method

Selection of the study site

- Bako Tibe district: Purposively based on crop density (similar site for NOT)

- Used stratified sampling for the 10 km X 10 km grid
- But random sampling within the 1 km X 1 km grid



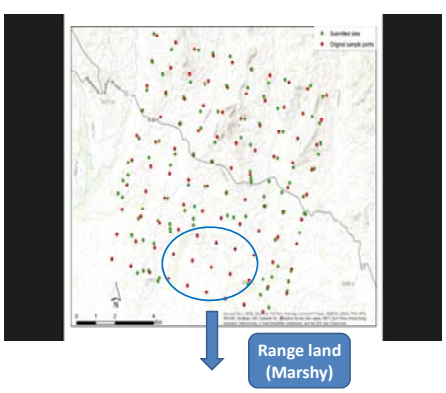
Training given for Researchers

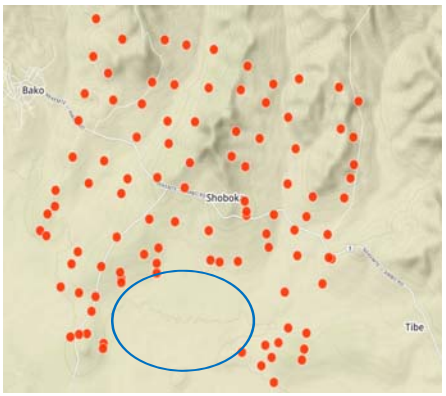
Survey team being trained on

- How to use ODK
- How to use GPS essential to navigate closer to sampling point

Survey team interviewing a widow farmer

- Four survey team took about 6 days to complete the survey during the vegetative stage and only four days during the flowering stage survey





Key challenges during the panel survey (ETHIOPIA)

- Long distance to walk on foot (5 km)
- Physical Barriers (river)
- Once the field is identified difficult to get farmers (might be on farming practice somewhere else, gone to market, social gatherings etc)

2. Experience from Nigeria

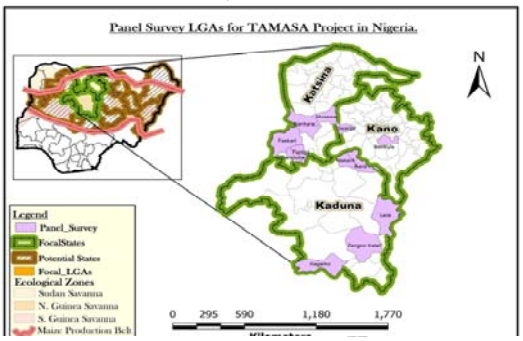
How was the sites selected?

- Fields were selected to cut across rainfall gradient from Sudan to Guinea Savanna
- Clustered approach

How was data collected?

- Paper based since training on how to use ODK was not given in time

Which area was sampled?



Training given for data collector (But late)

Key challenges during the panel survey (Nigeria)

- Overlap of activities/harvesting (NOT, baseline, Panel survey)

Key discussion points:

- `What is the purpose of this panel survey?
- Are we collecting the right agronomic data? Can we be more quantitative? How can we capture more agronomic data? (spacing used, dominant weed type, weed control method, disease severity, disease and pest control method?)
- Are we collecting the right socio-economic data? Which additional socioeconomic data should we include?
- Can we cluster the sampling points to be able running drones?
- Can we link this results to the results of NOT use-case and the baseline survey result?

- How many locations (representative samples) do we need? Can we manage more sites?
- Can we collect these data from farmer diaries/self-recording?

Nutrient Omission Trials & Tools

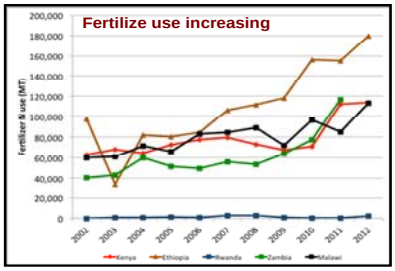
by

Shamie .Zingore (IPNI), Jairos Rurinda (IPNI) T.Balemi (CIMMYT Ethiopia) & J.M. Jibrin (Bayero University Kano)

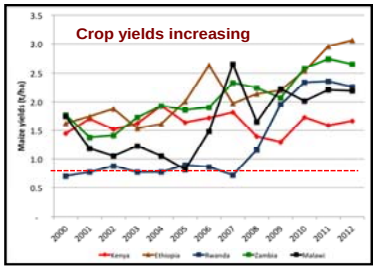
Outline:

- Background
- Nutrient Omission Trials
- Design | Implementation | Data management
- QUEFTS Model & Nutrient Expert Decision Support Tool
- Scaling and Partner Engagement

The status of maize production in sub-Saharan Africa

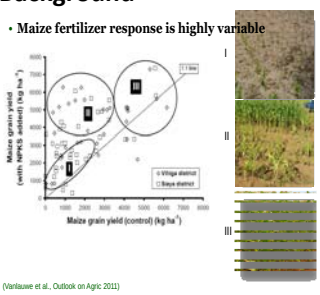


FAO statistics

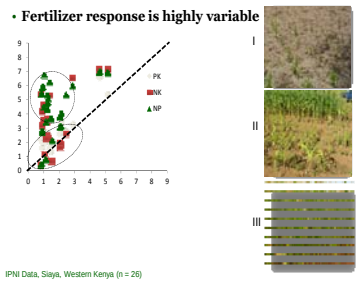


FAO statistics

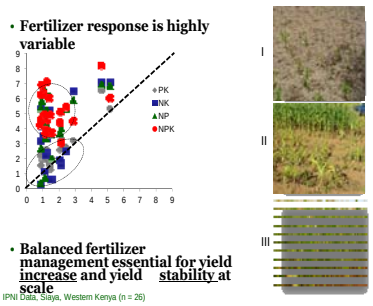
Background



(Vanlauwe et al., Outlook on Agric 2011)

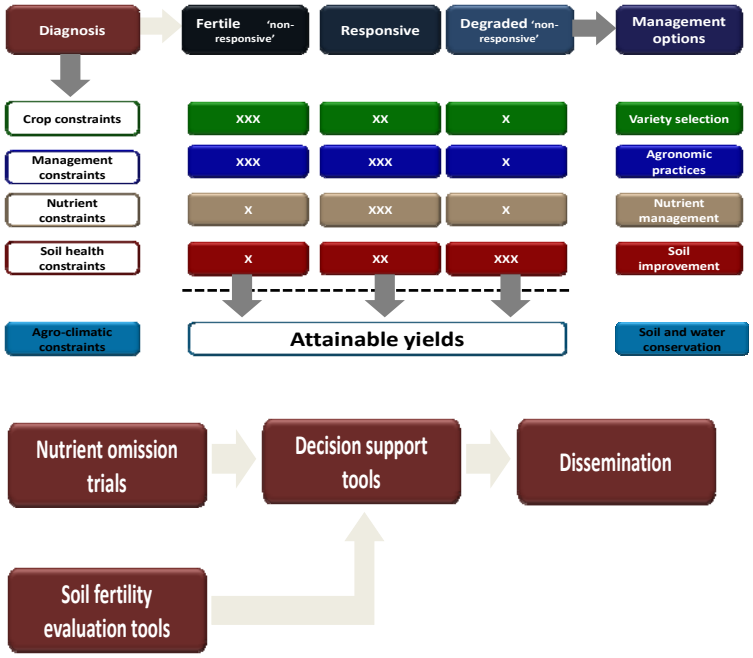


IPNI Data, Siaya, Western Kenya (n = 26)



IPNI Data, Siaya, Western Kenya (n = 26)

Nutrient Management Recommendation Approach



What are we solving for?

- Maize production systems in SSA are complex and characterized by highly variable soil fertility conditions (*and crop responsiveness to inputs*) in time and space.

✓ Develop/validate standard methods and tools for systematic and cost-effective characterization and diagnosis of soil constraints considering spatial and temporal dimensions.

✓ Co-develop with development partners scalable applications and tools for improved decision making in the development and dissemination of site-specific nutrient management recommendations.

✓ Generate evidence on the value of improved decision making in nutrient management recommendations for maize production intensification at various spatial scales.

Nutrient Omission Trials

In a nutshell, the 4R nutrient stewardship strategy involves crop producers and their advisers selecting the right source-rate-time-place combination from practices validated by research conducted by agronomic scientists. Goals for economic, environmental and social progress are set by—and are reflected in performance

indicators chosen by—the stakeholders to crop production systems.
A question for you, and all of us, to ponder. Is our participation – i.e. the fertilizer industry's

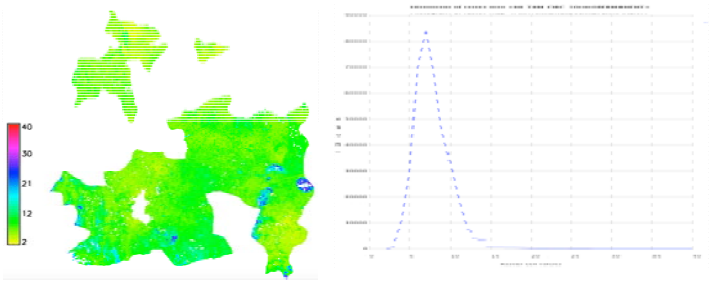
Objectives

- To gain understanding of the local maize production system and factors affecting yield and nutrient-limited yield gaps:
- ✓ Farm socio-economic and soil fertility variability
- ✓ Historical and current management practices
- ✓ Climate
- Establish standard crop- and soil based approaches and norms for rapid diagnosis of soil fertility and nutrient constraints.
- To develop maize yield, yield response and nutrient uptake datasets for calibration of decision support tools (including NE) for development, evaluation and scaling of SSNM practices under variable soil fertility and climatic conditions

Site selection

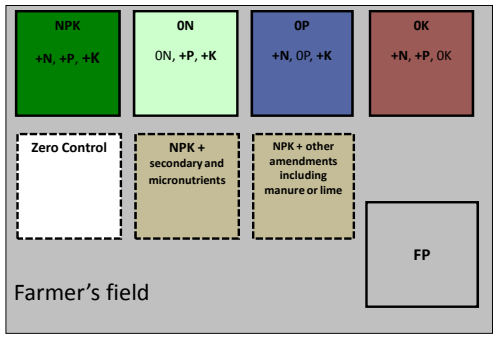
- Original design: stratified selection in region of interest.
- Nigeria & Ethiopia: Regions of Interest for partners.
- Tanzania: Selected AfSIS sentinel sites in region of interest.

Site selection

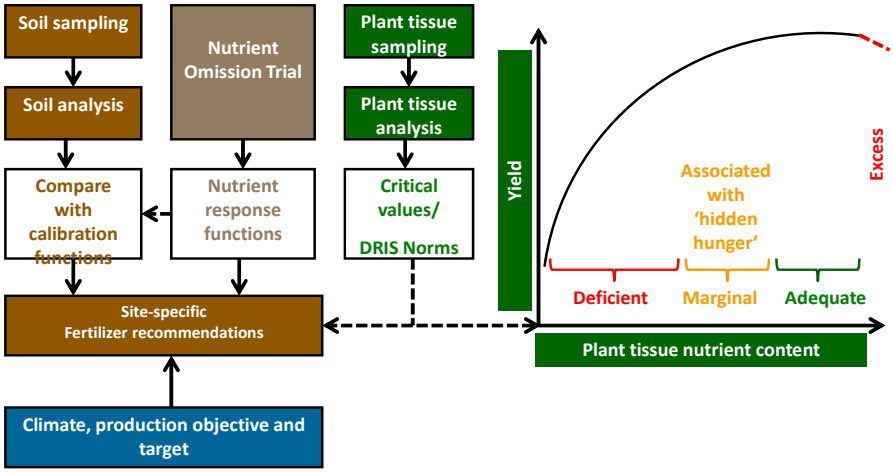


AfSIS prediction: Organic Carbon for TAMASA focal areas in Nigeria, excluding the non-cropland areas

Design



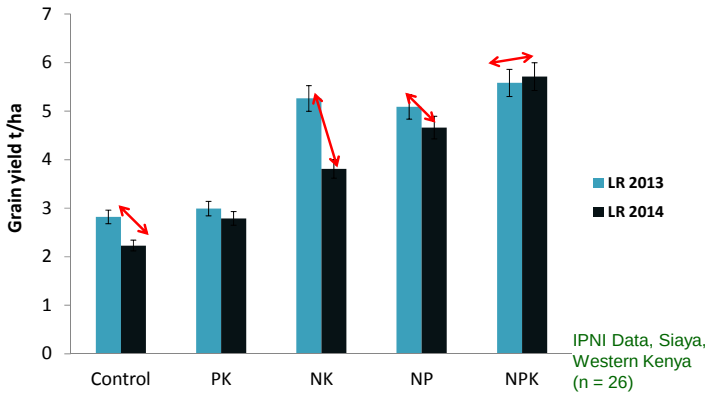
Consolidated fertilizer recommendation framework



Gold Data Standards'

- Field characterization
- ✓ Farm socio-economic and soil fertility variability
- ✓ Historical and current management practices
- Soil sampling, preparation and analysis
- ✓ Standard soil properties and (soil depth?)
- Ear leaf samples
- ✓ Sample handling critical
- ✓ Complete macro and micronutrient analysis (boron?)
- Yield measurements
- ✓ Grain and crop residue yields: harvesting plan?
- ✓ Sample preparation and storage for NPK analysis

- Subset of sites selected for multiple season yield and nutrient response assessment.
  - Cluster analysis to select representative soil and response categories
  - Student projects?



Discussion

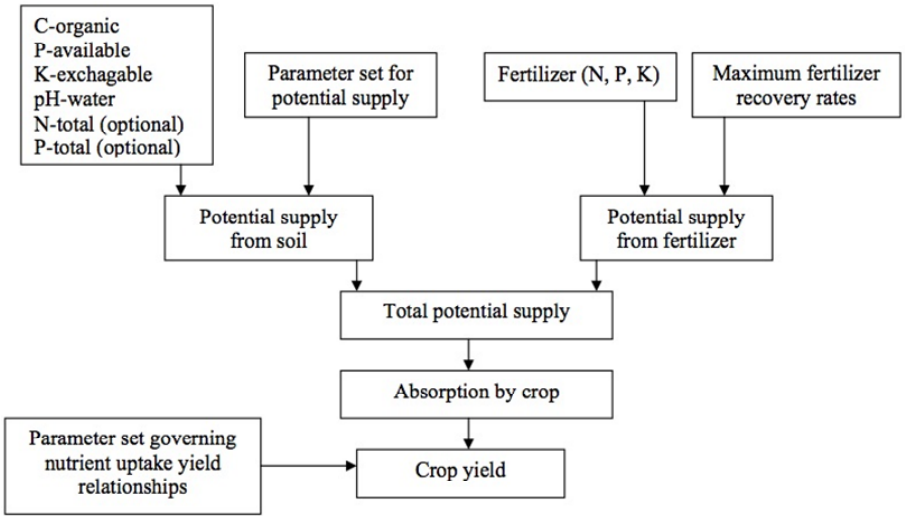
- Implementation challenges and lessons
- Tanzania, Ethiopia and Nigeria planned activities
- Data management
- ✓ ODK forms for Nutrient Omission Trial data collection
- ✓ TAMASA NOTs database?

QUEFTS model and Nutrient Expert

Quantitative Evaluation of Soil Fertility in Tropical Soils

- QUEFTS was developed as a generic approach for evaluation of soil fertility and site-specific NPK fertilizer requirements.
- Calibration is based nutrient omission trials to determine indigenous NPK supply potential.
- Crop-specific approach and indirectly accounts for cropping systems, manure, crop residue management etc.

QUEFTS Framework



QUEFTS steps

1. Potential supplies of nitrogen, phosphorus and potassium are calculated:

- Calibrated based on nutrient omission plots.
- Apply relationships between chemical properties of the 0-20 cm soil layer and the maximum quantity of those nutrients that can be taken up by maize.

- Assume no other nutrients and no other growth factors are yield-limiting.
- The soil properties needed for this step are:

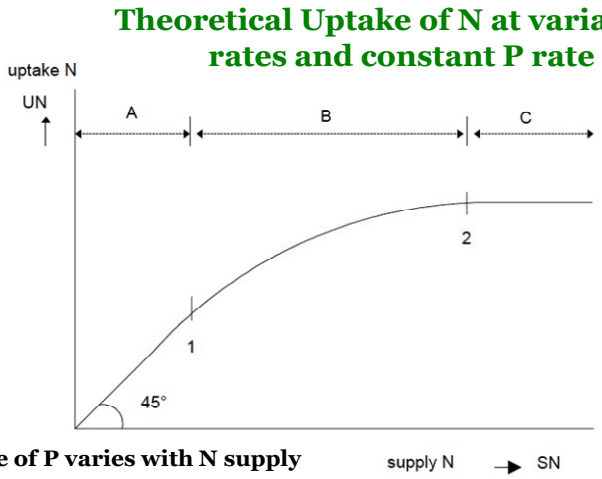
✓ Soil pH; Organic Carbon (org.C.); P-Olsen; Exchangeable potassium (exch.K)

i) Potential supplies of nitrogen, phosphorus and potassium are calculated

- SN = max[1.7 × (pH − 3) × org]
- SP = max[0.35 × (1− 0.5 × (pH − 6)2) × org.C + 0.5 × P.Olsen]
- SK = max[0.35 × (2 + exch.K) × (55 − org.C),]

Equations adjustable to site-specific conditions

ii) *The actual uptake of each nutrient is calculated as a function of the potential supply of that nutrient, taking into account the potential supplies of the other two nutrients.*

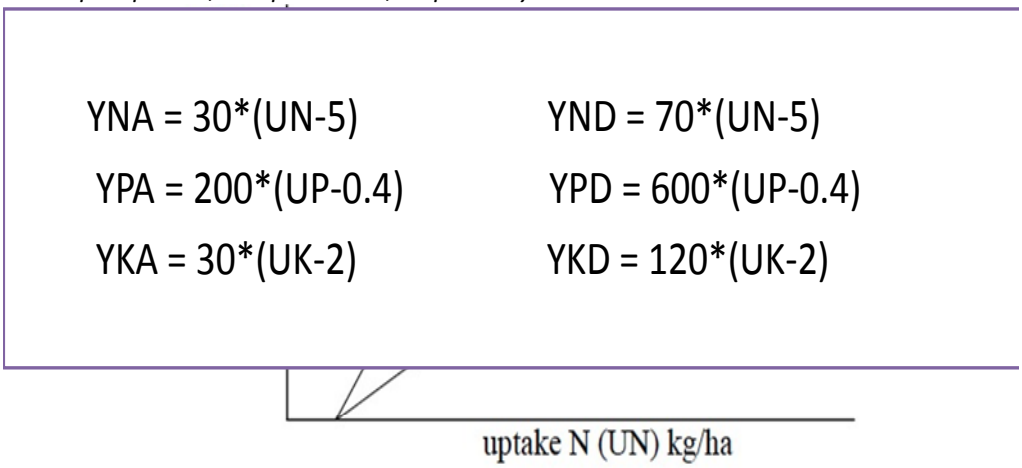


Uptake of P varies with N supply

When supply of N is small, all N is taken up (A)

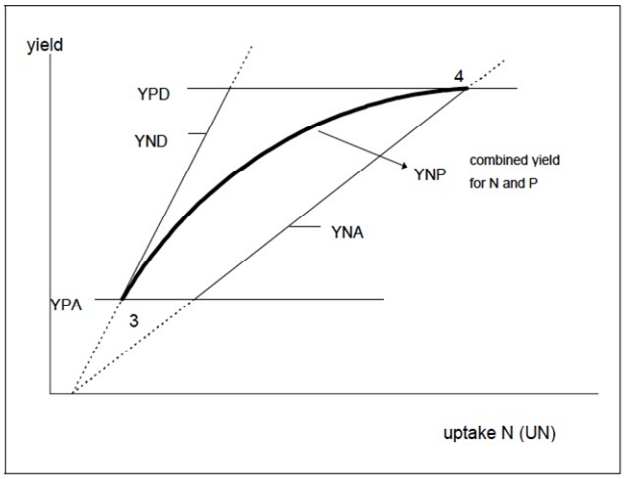
When supply of N is large, all P is taken up (C)

iii) Establishment of three yield ranges, as depending on the actual uptakes of nitrogen, phosphorus, and potassium, respectively.



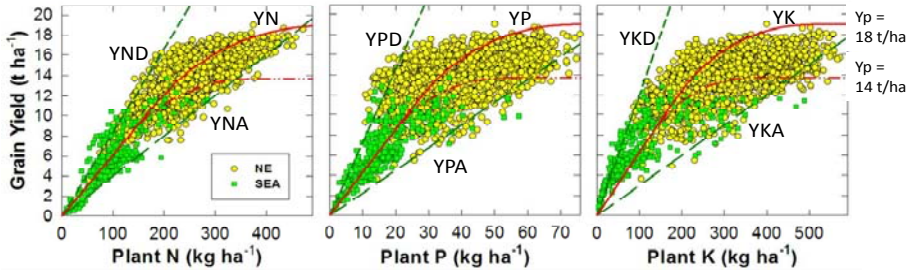
iv) Yield estimates are calculated in pairs on the basis of the actual uptake of each nutrient (UN, UP, UK) and the yield ranges calculated in step 3 (YNA, YND, YPA, YPD, YKA, YKD).

- This will result in paired estimations (YNP, YNK, YPN, YPK, YKN, YKP) which are averaged



Estimation of crop nutrient requirements for maize based on NOTs

- The simplified relationship is derived from extensive datasets
  - Nutrient content ranges for a various yield levels and sites are consistent for each cereal crop.



Source: Setiyono et al. 2010

Estimation of crop nutrient requirements for maize based on NOTs

Parameters	**N**	**P**	**K**
No. of Observations	2341	2363	2361
Constant *a*(kg grain/kg nutrient	40	225	29
Constant *d*(kg grain/kg nutrient	83	726	125
Reciprocal internal efficiency* (kg nutrient/ kg grain) / 1000			

***** *RIE at 80% of yield potential*
Constant a= slope of the line of maximum accumulation; minimum internal efficiency
Constant d= slope of the line of maximum dilution; maximum internal efficiency

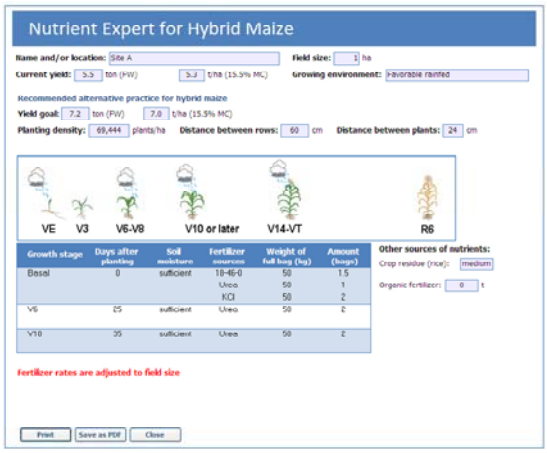
Quefts

- Applied for a wide range of crops in Africa and Asia
- Maize
- Wheat
- Rice
- Other (Cassava)

Developing Decision Support Tools

Nutrient Expert

- *Nutrient Expert* is based on the principles QUEFTS
- *Nutrient Expert* will help local experts (researchers, extension agents) formulate quickly location-specific fertilizer guidelines
    - a tool that will help in the rapid implementation of SSNM in the field



Sample of a fertilizer guideline for maize tailored to location-specific conditions and locally-available fertilizers

1. *Develop algorithm and decision rules.*

- Use experimental data to develop the algorithm for calculating fertilizer N, P, and K requirements (SSNM strategy for a crop and region)
    - ✓ Attainable yield
    - ✓ Yield response to fertilizer N, P, and K
    - ✓ Target fertilizer use efficiency (i.e. agronomic efficiency)
- Use available existing information to estimate attainable yield and yield responses – decision rules
    - ✓ Current yield
    - ✓ Characteristics of the growing environment
    - ✓ Soil properties
    - ✓ Farmers' crop management practices

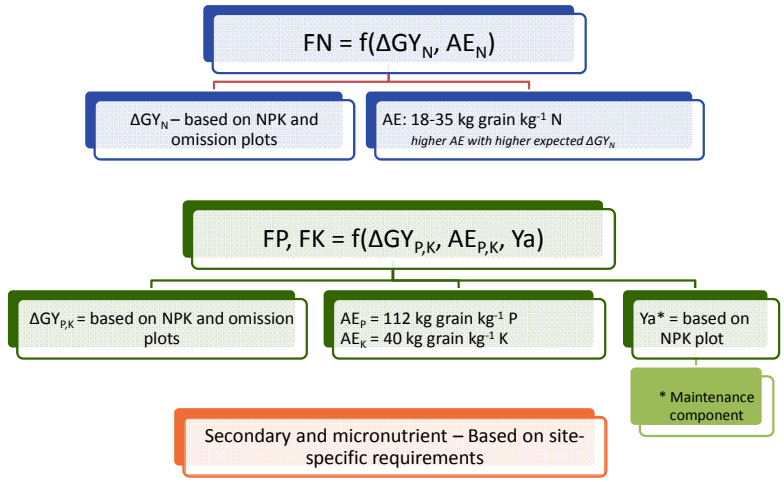
2. *Consultation with local experts*

3. Programming (algorithm, interface)

4. Field validation or evaluation of NE beta version

5. Release of final version

Algorithms to determine NPK requirements

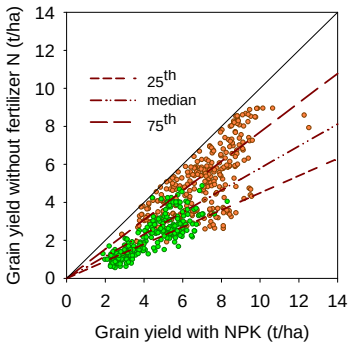


Nutrient Expert uses existing information to provide estimates of attainable yield and yield response to fertilizer

Parameter	Indirect Estimate as a Function of…
Attainable Yield	• Current farmers' management (yield, planting density) • Growing environment (water availability, risk of flood/drought, soil depth, other soil-related constraints) • Modeling of yield potential
Yield Response	• Soil characteristics (soil type, soil color/OM content, history of manure/compost use) • Soil test results (if available) • Nutrient balance (P and K) from previous crop

Estimating Yield Response to Fertilizer

- The indigenous N supply class (low, medium, high) is estimated from soil characteristics (texture, soil color and/or organic matter content)
- The N-limited yield for a given attainable yield and soil fertility class is estimated from the relationship of N-limited yield to attainable yield (i.e. GYoN/Ya). We assume that:
  - the *median* represents soils with average fertility or indigenous N supply (INS)
  - the *25th* percentile represents low INS
  - the *75th* percentile represents high INS



Source: IPNI data

Scaling and Partner Engagement

- V0 developed for Tanzania and Ethiopia in November 2015
- V1 developed for Tanzania and Ethiopia in November 2015
- Planning meeting for linking QUEFTS to spatial data:

✓ AfSIS soil data?
✓ TASAMASA tools?
✓ Other diagnostic tools – mobile soil analysis tools, M/NIRS
✓ Other DSTs - OFRA?

- Stakeholder meetings:

✓ Tanzania October 2015
✓ Nigeria November/December 2015
✓ Ethiopia November/December 2015

TAMASA VARIETY DSS

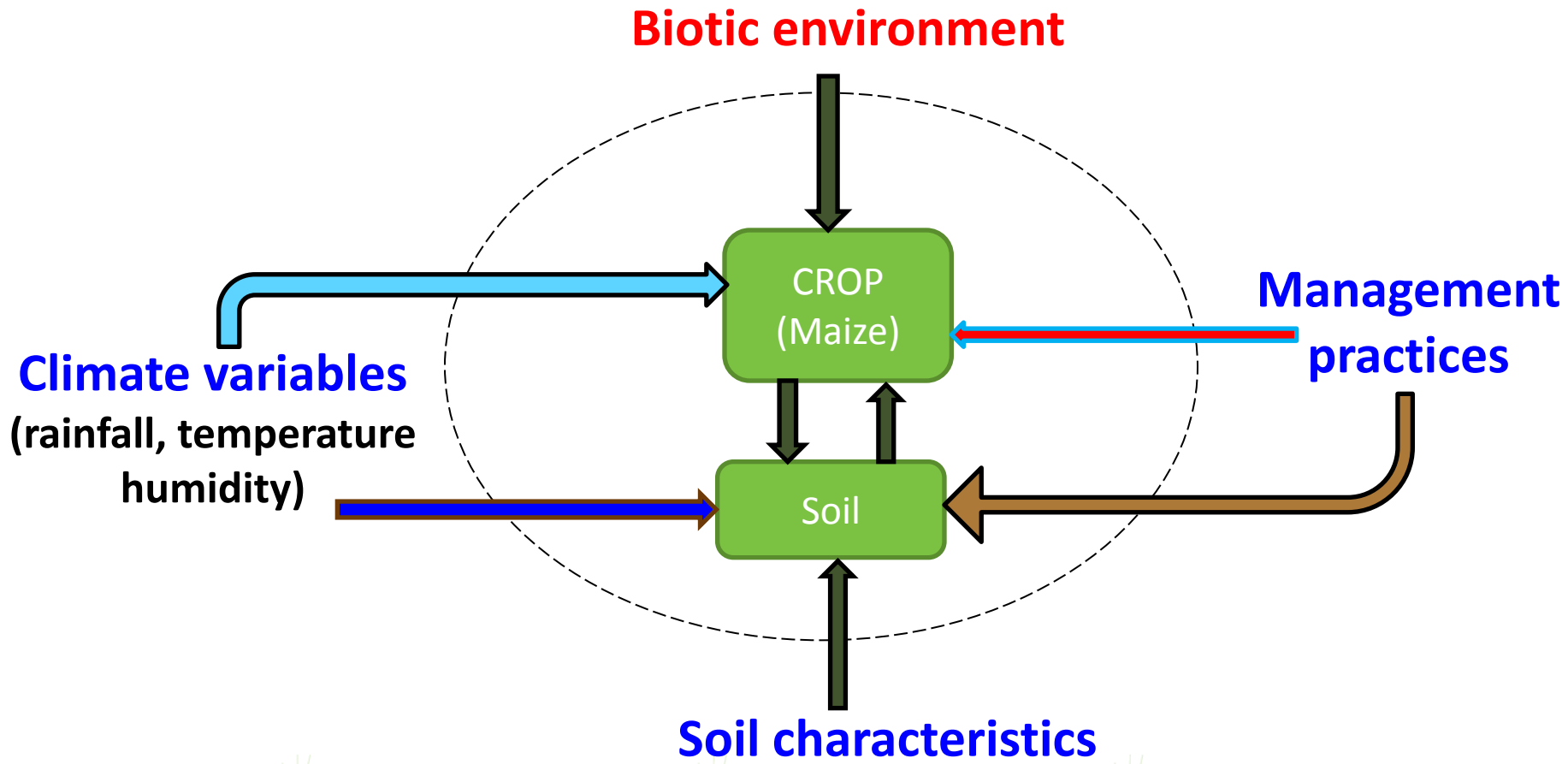
H. Tonnang/ J. M. Jibrin

CIMMYT MR

PURPOSE

To develop a tool that allows users (advisor, input dealer, farmer) to identify well-adapted varieties (in terms of **maturity date ? Or yield**) for a particular location (based on **user defined sowing** date ?). The tool will include other available and relevant information on the variety(ies) in question, such as **grain type** and **colour**, **drought-tolerance**, **pest and disease** resistance

Schematic representation of crop system model



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Data types needed

1. Site geo-reference information

- Latitude, longitude and elevation

2. Daily Weather

- Minimum and maximum temperature
- Precipitation or rainfall
- Total solar radiation or sunshine hours

3. Soil Data

- Soil taxonomy (if available)
- Soil slope
- Soil color
- Stones (%)
- Soil texture, including % sand, silt, and clay and stones, especially for the surface layers
- Soil organic carbon
- Bulk density is desirable
- Lower Limit of plant extractable soil water (LL) or permanent wilting point and Drained Upper Limit (DUL) or field capacity and saturated limit of soil available moisture (SAT)

Data types needed

4. Management Data

- Date of planting
- Plant spacing or density. This would be the plant stand and not the seeding or sowing density.
- Crop and cultivar name and its characteristics.
- Planting material, e.g. seed, cuttings, etc.
- Planting mode, e.g., row, hill, flat, ridge, etc.

5. Input information

- Irrigation amount and timing of the irrigation application
- Fertilizer amount and type, timing of the fertilizer application, placement depth and application method
- Amount of organic manure or residue, composition, time of the application, placement or incorporation depth and method of application
- Amount and type of chemicals applied and for what purposes

Data types needed

6. Crop and Soil Response Measurements

- Grain yield (kg/ha)
- Anthesis and silking dates, and maturity date. Time of first seed or first grain would also be helpful
- Number of main stem nodes
- Above ground biomass
- Plant density at harvest
- Number of ears, pods, or other fruiting structures per unit area
- Average weight per unit grain, seed, fruit or other harvested material
- N and P concentrations of grain and other plant components

Data types needed

7. Initial Conditions

- Previous field history
- Initial soil moisture versus depth
- Initial nutrients (NO_3^-, NH_4^-, P) by layer
- Other soil chemical properties as needed for the experimental objectives
- Surface residues at the start of simulation or at planting
- Crop type or manure type (total amount as dry weight; %N and %C (and %P) contents; incorporation depth and % incorporation)

DATA TYPES NEEDED DSS

8. Calibration Data Requirement

- All of the data taken above plus the following:
- Date of emergence
- Date of flowering
- Date to physiological maturity
- LAI and canopy dry weight at 3 stages during life cycle
- Canopy height and breadth at maturity
- Economic Yield
- Canopy dry weight or harvest index
- Single grain weight
- Number of seeds per cob
- Damage level of pest
- Number of leaves on main stem at physiological maturity
- N percentage of economic yield (grains)
- N percentage of non-economic parts (leaves and stem)

Conceptualization

- Biological systems are made of interacting chemical and physical processes, they are composed of subsystems with unique characteristics and behavior that contribute to the overall function of the whole system
- Complex systems can be non-linear, difficult to formulate any mathematical expresssion and are multi-variate.
- Traditional methods (differential equations) are not always adequate to model complex system.
- ML is a useful tool for modeling such systems.
- ML produces results that even surpasses those derived from traditional methods.

Process based model

- A model is a simplification of the real system, with assumptions that may or may not be acceptable for a particular application.

- Model can be treated as a system of differential or difference equations that describe the dynamics of the system; or it can be look at as a set of static equations that describe how responses of interest at particular times depend on explanatory variables.

Difference in crop system model

Differences are due to dissimilarities in assumptions among models about what controls the development and **growth processes** in the crop and how **soil water** and **nitrogen change** over time

$$\frac{d(U_1(t))}{dt} = g_1(\boldsymbol{U}(t), \boldsymbol{X}(t), \boldsymbol{\theta})$$

$$\vdots$$

$$\frac{d(U_S(t))}{dt} = g_S(\boldsymbol{U}(t), \boldsymbol{X}(t), \boldsymbol{\theta})$$

t is time

U(t)= [u1(t), .., us(t)]T is vector of state variables (crop biomass, root depth, soil water content etc.)

X(t) are climatic variables

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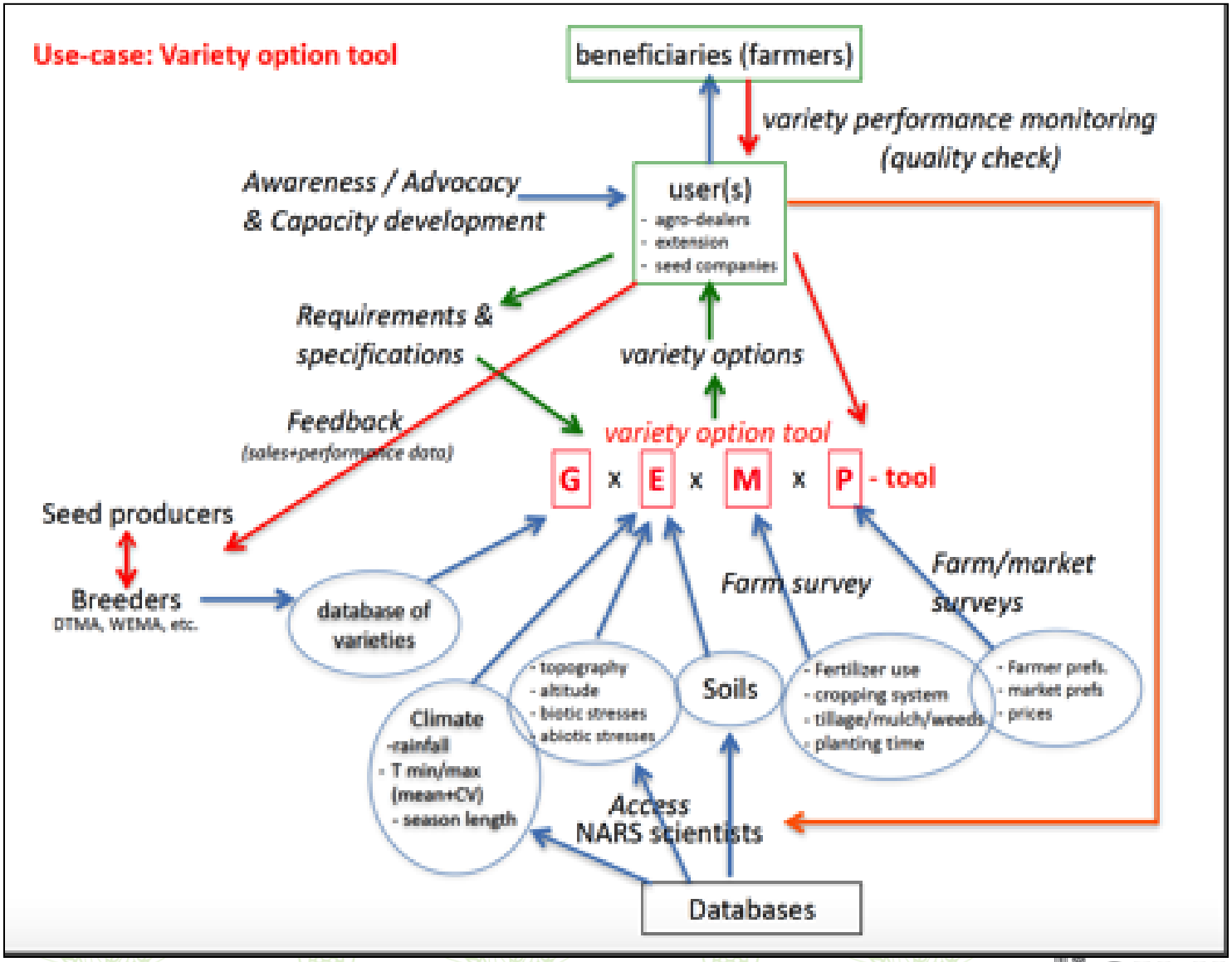
Variety use-case developed in Addis



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DSS with machine learning (FL)

- Fuzzy Logic is a multi-valued logic that allows intermediate values to be defined between Aristotelian logic evaluations, where only true/false, yes/no or 1/0 is used.
- Notions such as yield can be formulated mathematically and processed by computers.
- It provides a simple way to arrive at a definite conclusion based upon vague, ambiguous, imprecise, noisy, or missing input information.

DSS with machine learning (FL)

- Fuzzy logic represent knowledge in the form of if-then-else rules.
- Initial stage of building a Fuzzy logic system is to acquire the rules (knowledge acquisition stage)
- Knowledge acquisition requires the interaction between two specialists: A *knowledge engineer* and a *domain expert*.
- The outcome of such a meeting is that a preliminary rule base is produced.

DSS with machine learning (FL)

- The rules are evaluated on trial data with errors noted.
- Following this, subsequent meetings are held between the two specialists to resolve all the erroneous issues.
- The main problem associated with the construction of Fuzzy logic is that sometimes the domain expert may not be fully cooperative or he/she might find it difficult to create rules that he/she uses in his work.
- Hence, the system may not be fully realized.

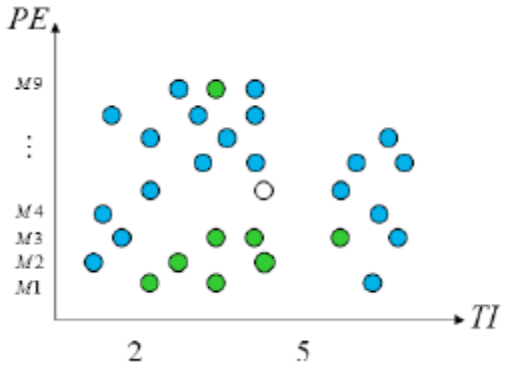
DSS with machine learning (RF)

- **Random forest** is an ensemble classifier that consists of many decision trees and outputs the class that is the mode of the class's output by individual trees.
- Decision trees are individual learners that are combined. They are one of the most popular learning methods commonly used for data exploration.
- CART … greedy, top-down binary, recursive partitioning, that divides feature space into sets of disjoint rectangular regions

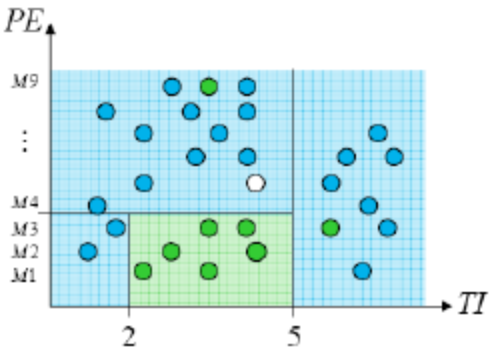
Decision trees involve greedy, recursive partitioning

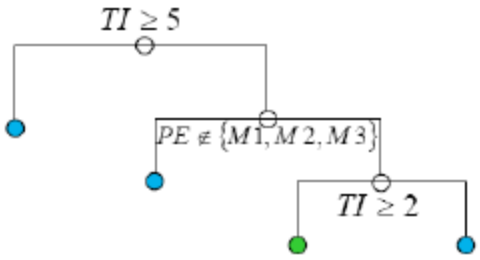
- Simple dataset with two predictors

TI	PE	Response
1.0	M2	good
2.0	M1	bad
...	...	...
4.5	M5	?



- Greedy, recursive partitioning along TI and PE





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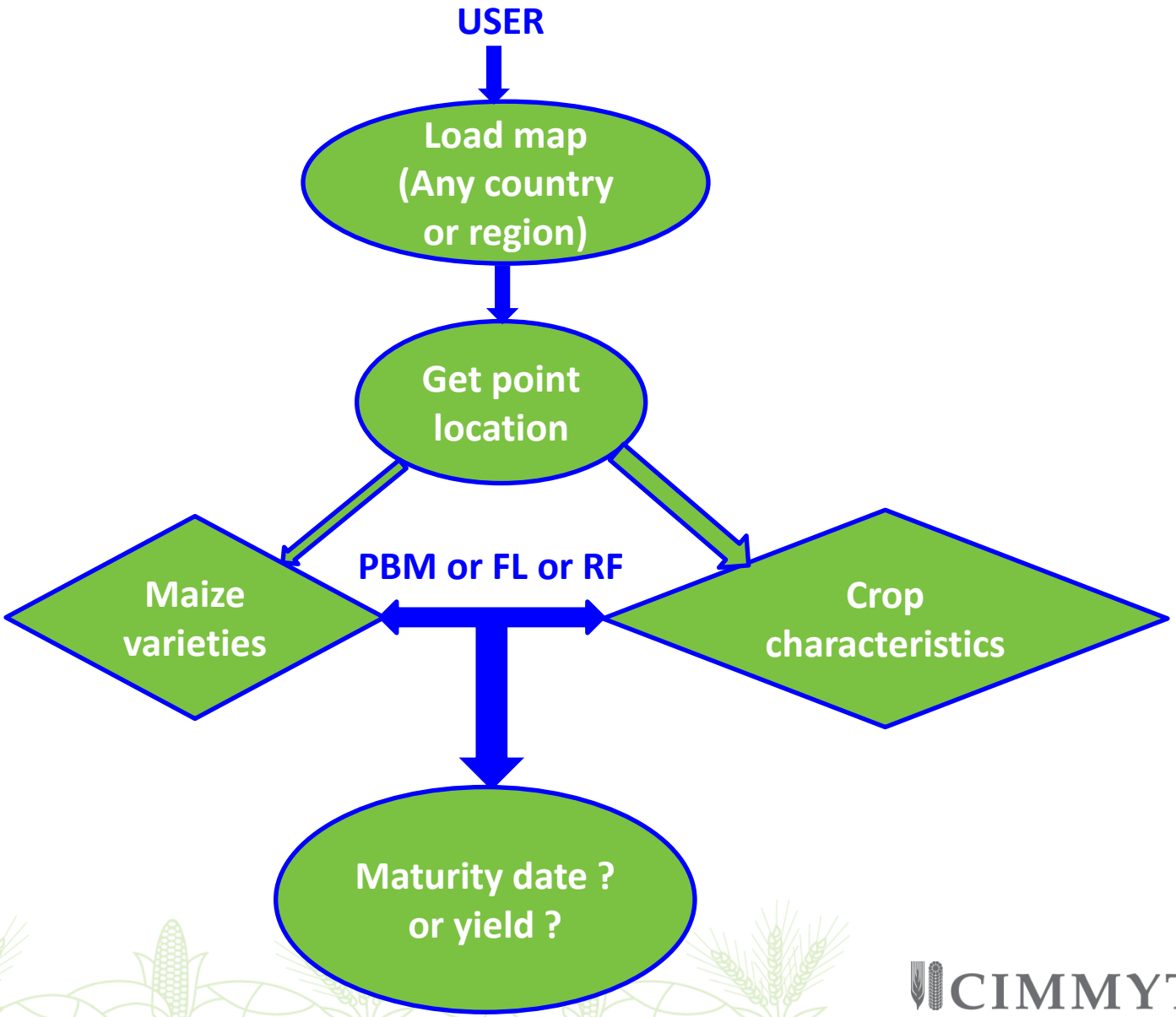
Features and advantages

- It is one of the most accurate learning algorithms available. For many data sets, it produces a highly accurate classifier.
- It runs efficiently on large databases.
- RF can handle thousands of input variables without variable deletion.
- It gives estimates of what variables are important in the classification.
- It generates an internal unbiased estimate of the generalization error as the forest building progresses.
- RF has an effective method for estimating missing data and maintains accuracy when a large proportion of the data are missing.

DSS spatial approach



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Keys Discussion points?

- The develop DSS will predict be used to predict maize maturity date or yield?
- What quality of data can we produced?
- Which approach to adopt; Data Mining or Process based model?
- Can we fix a time frame for a DSS prototype development?

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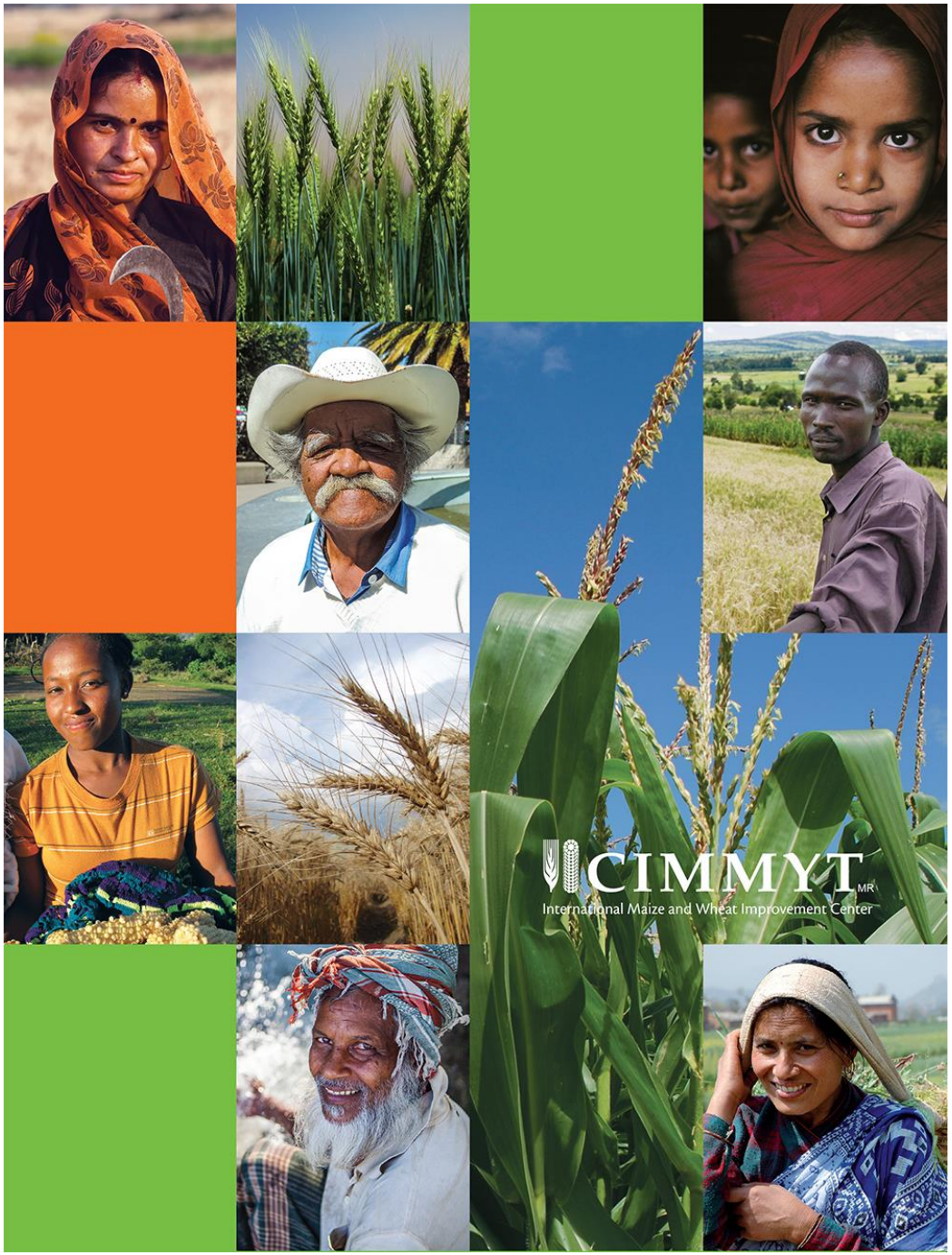


Thank you for your interest!

Variety selection tool

S/N	Actors	Roles	Linkages	Support needed in capacity building
1	CIMMYT (H. Tonnang)	Tool development	Model development	-
2	BUK (Adnan)	Scientific basis and providing data for the tool	Model development	In progress
3	IAR	Varietal information	Multi-location trial data (To be provided)	Accurate data collection
4	IITA	Varietal information	Multi-location trial data (To be provided)	-
5	Seed companies (Seed Co, Premier Seeds)	Provision of seeds/variety targeting	Inventory of seeds in the market and pedigree	Usage and interpretation of tool
6	NAGRAB	Certification/Varietal information	Enforcement of in release of varieties along with their xtics	Usage and interpretation of tool
7	SG2000	Development, Dissemination to EAs and Capacity building	To be involved in tool development	Usage and interpretation of tool
8	NAERLS	Dissemination to EAs and Capacity building	To be involved in tool development	Training (To host the tool)
9	NIMET	Weather	Provision of weather data for tool development	Usage and interpretation of tool
10	NISIS	Soil data	Provision of soil data for tool development	Usage and interpretation of tool
11	AFSIS	Soil data	Provision of soil data for tool development	Usage and interpretation of tool
12	ADP	End users & Dissemination	End user and dissemination of tool	Usage and interpretation of tool
13	Farmers	End users	End user and dissemination of tool	Usage and interpretation of tool

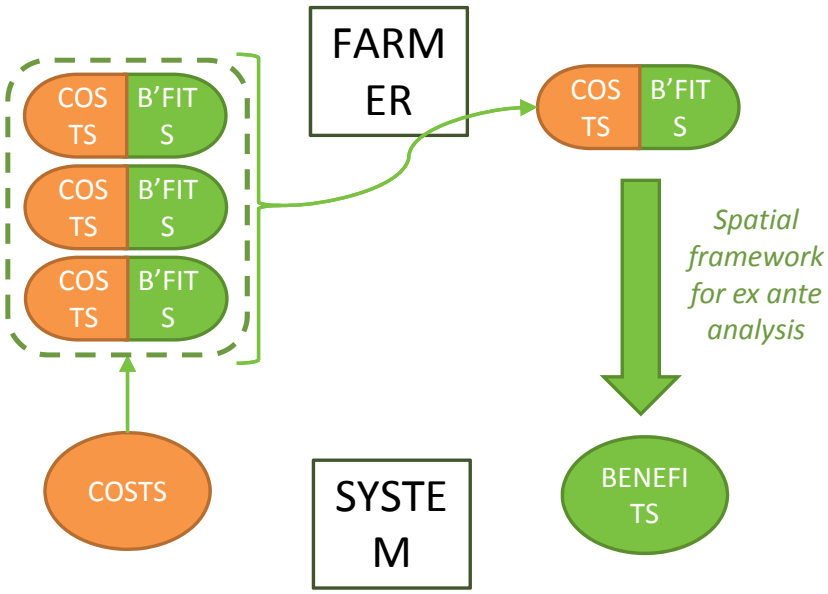
- *A workshop will be organized with all key actors to understand (usage and interpretation) the tool and benefits of the tool.*

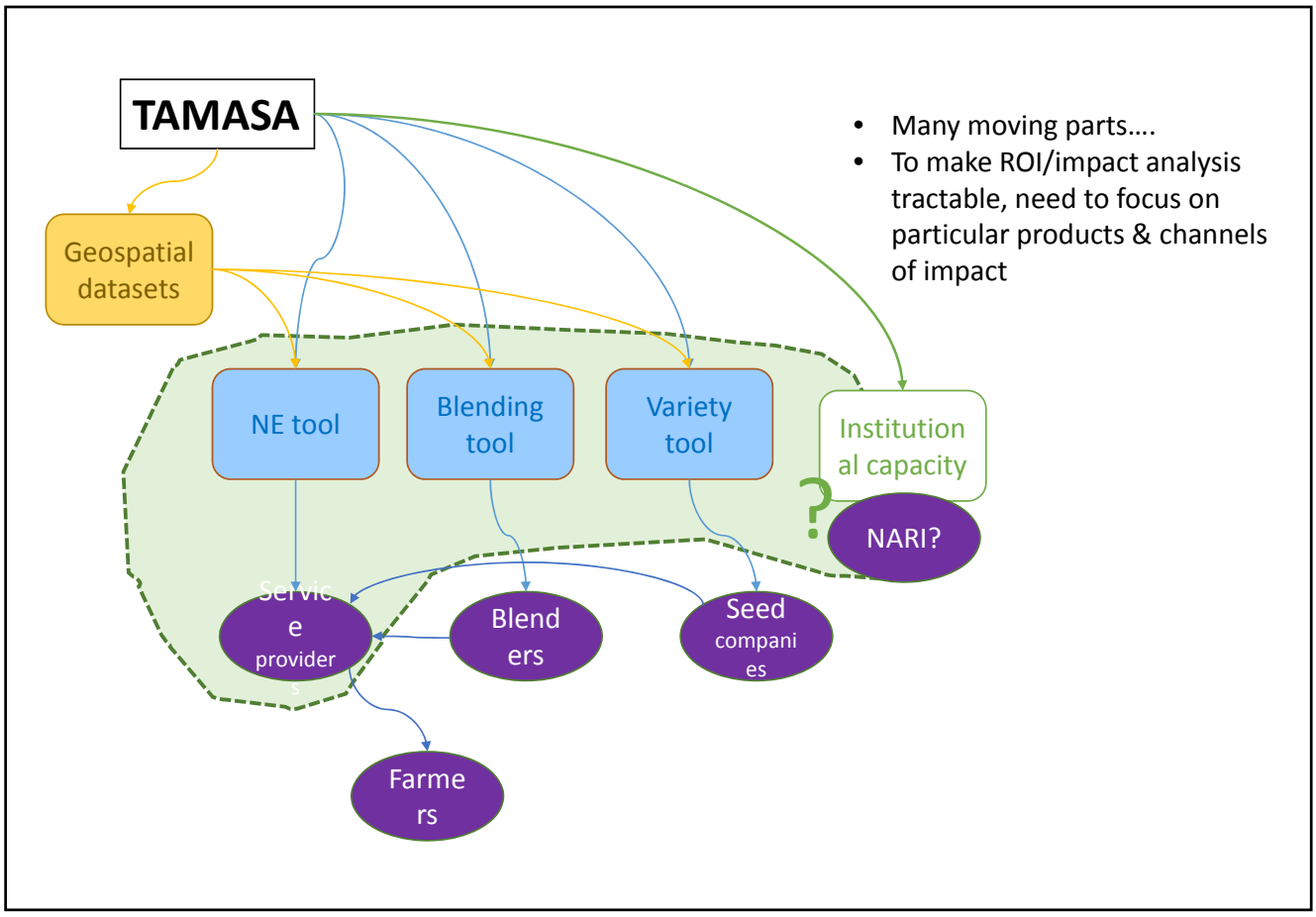
Econometrics & Socio-economics: Geospatial Econometrics, ROI & Risk

by

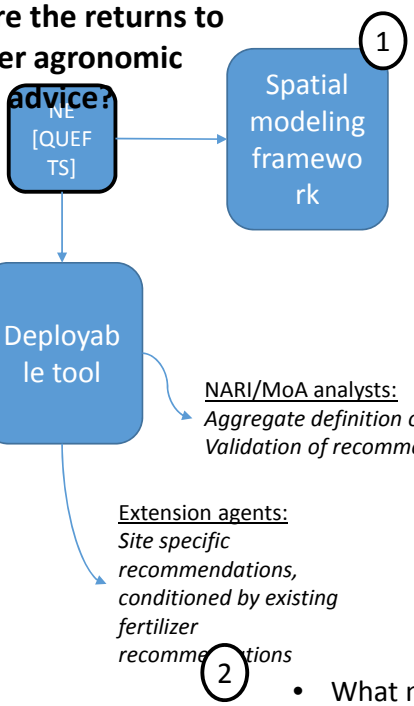
M.Jaleta ( ) & J. Chamberlin ( )

Return on Investment: costs and benefits




TAMASA
Geospatial datasets
NE tool
Blending tool
Variety tool
Institutional capacity
?
NARI?
Service providers
Blenders
Seed companies
Farmers
Many moving parts….
To make ROI/impact analysis tractable, need to focus on particular products & channels of impact

Initial focus: what are the returns to better agronomic advice?

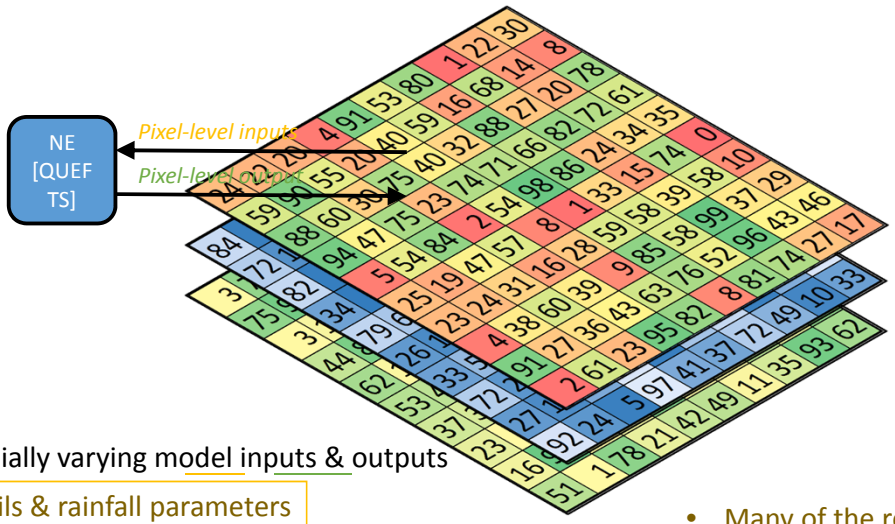


Ex ante questions:

- What aggregate improvement in yields over baseline?
- Where reductions/increases in recommended rates?
- Where are yield-improving recommendations likely to be profitable?
- How many farm households likely to benefit?
- What is the spatial distribution of likely benefits?

Experimental questions:

- What measurable improvement in yields over baseline?
- How much variability in intra-village recommendations? (intra-pixel, etc.)
- How much value added from plot-specific soil testing?



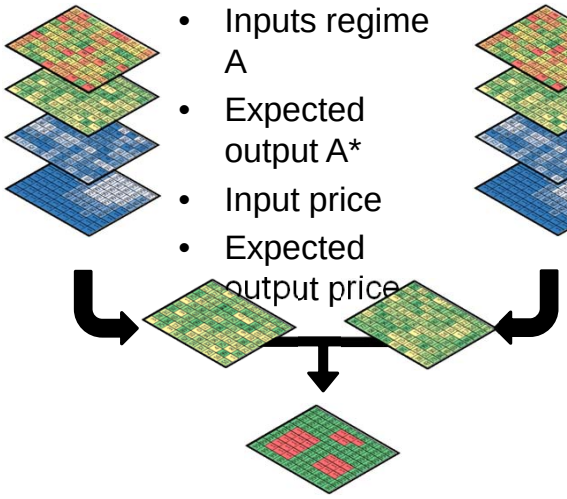
Spatially varying model inputs & outputs

Soils & rainfall parameters
Fertilizer prices
Labor costs
Output prices

Baseline: business as usual
Alternative: NE recommendation

- Many of the required inputs already exist (e.g. soils parameters from AfSIS)
- Spatial price data will need to be modeled on the basis of data from household surveys, market price info & geospatial covariates

Components of a spatial profitability analytical framework



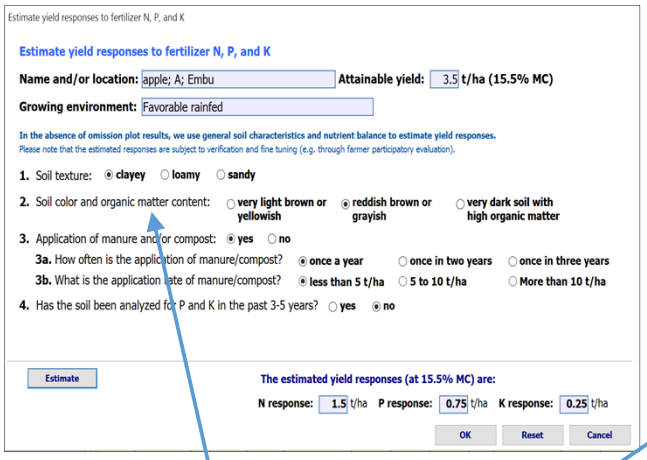
- Inputs regime A
- Expected output A*
- Input price
- Expected output price

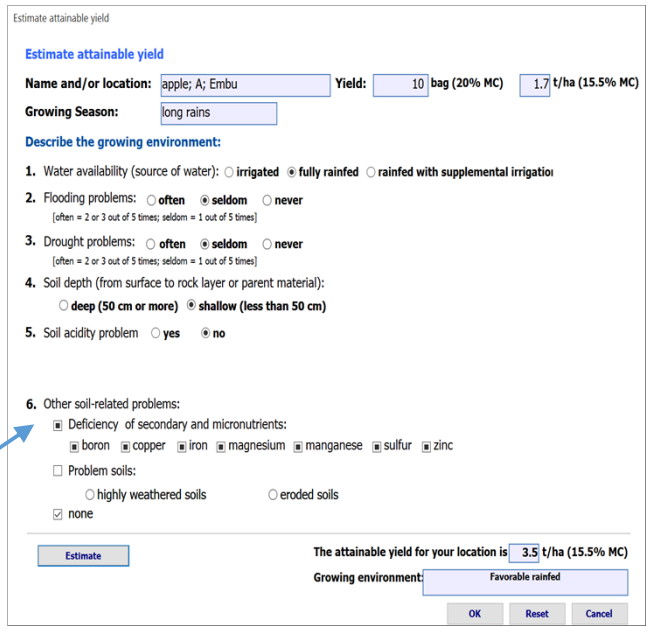
- Inputs regime B
- Expected output B*
- Input price
- Expected output price

Plot specific ***profitability distributions*** *under alternative recommendations*

** ideally: distribution of outputs under stochastic conditions*

Need to transform tool from current format…





Need to obtain this information from existing gridded datasets on soils, climate, etc.

Capacity Development & Training Needs

by

J. A. Andersson CIMMYT) & P. Craufurd (CIMMYT, Nairobi)

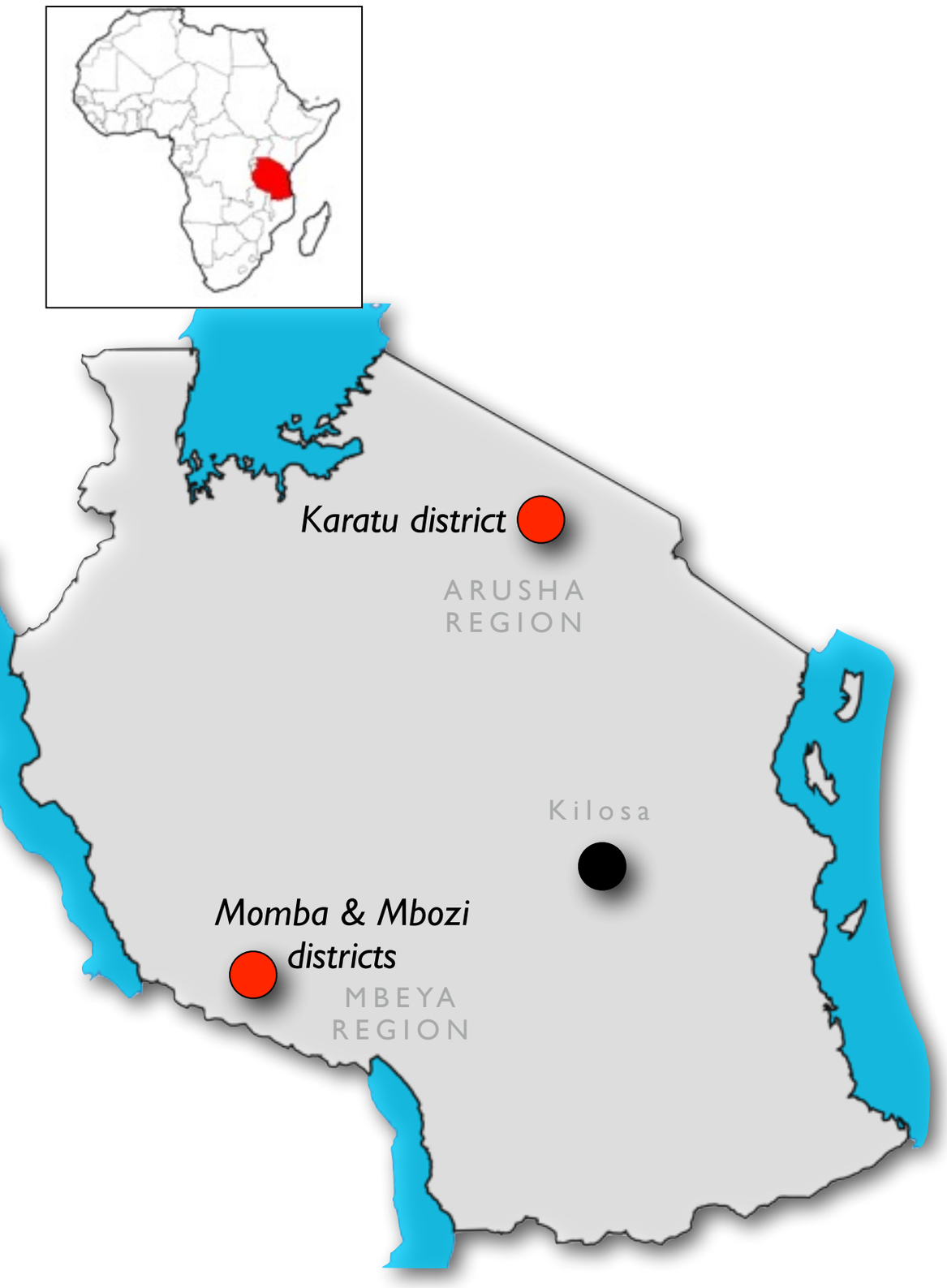
Knowledge Network and Knowledge, Attitudes and Practices (KAP) study Tanzania

Taking Maize Agronomy to Scale in Africa (TAMASA)
Annual Review and Planning Meeting
Sandralia Hotel, Abuja Nigeria, 13-15 October 2015

Jens A. Andersson, Kenneth Masuki, Remco Mur
Lameck Nyaligwa, Arnold Mushongi

j.andersson@cgiar.org

CIMMYT



Study Aims & Methods

Aim: Understand the current institutional landscape of agricultural knowledge dissemination in target geographies

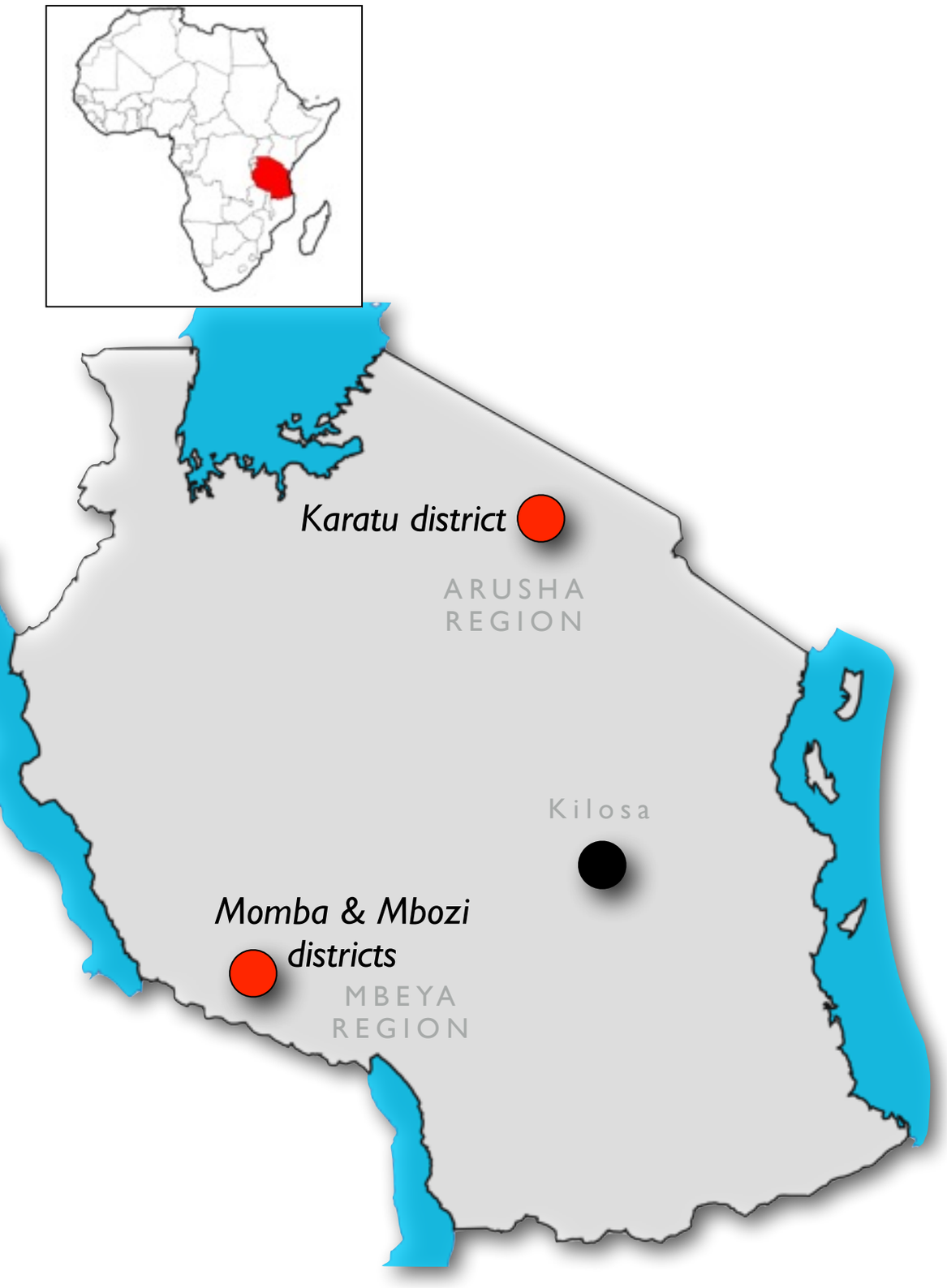
- *to support development of analytical and decision-support tools for/with service providers,*
- *to inform capacity building strategies that institutionalise TAMASA products*

Knowledge Network Analysis (KNA)

- Inventory of local-level knowledge service providers
- map knowledge exchange patterns among maize sector stakeholders;
- detect existing constraints in knowledge flows *(incl. different levels)*

Knowledge, Attitude, Practices (KAP)

- Assess service providers' KAP with regard to maize agronomy and service provision *(to different categories of farmers, incl. gender)*



Methods (2)

- ***Workshops*** with maize sector stakeholders
  Focus: organisation & constraints knowledge exchange
  Karatu (n=26), Mbozi (n=25)
- ***Interviews*** with selected maize sector stakeholders
- ***Questionnaire*** among maize sector stakeholders (N=56)
  KAP relating to maize agronomy
- ***Focus group discussion*** (FGD) with 15 farmers in Mbozi
  (well-connected farmers!)

- *Six knowledge categories used:*
  (1) fertilizer use
  (2) seeds and varieties
  (3) agronomic practices (incl. soil fertility management)
  (4) weed and disease management
  (5) weather and climate information
  (6) (output) market information

Significance of maize in TAMASA geographies

Roadside seller, Karatu

Karatu, Arusha region (north)

- Diversified rural economy
  (trade, tourism, agro-pastoralism, agriculture)
- Maize is food crop for many, cash crop for some
- Arusha is centre of seed sector
- Selian Research Centre


NFRA maize storage., Mbozi

Mbozi/Momba, Mbeya region (southwest)

- Agricultural economy
- Southern Highlands: agricultural 'hotspot' of TZ
- Maize is food and cash crop for many
- Maize export ban — market and price constraints
- Uyole Research Centre

Main constraints to maize sector development

'There is a large number of farmers an extensionist is supposed to serve. I am serving 18,000 farmers in one ward.'

(Local extension officer, Karatu)

On capacity of government research:

Uyole ARC, has 44 researchers and 8 staffed sub-stations in the Southern Highlands – an area with approx. 1.2 million crop growing households

(Director Uyole ARC, National Bureau of Statistics, Tanzania Agricultural sample Census 2007/2008)

On seed companies and knowledge on varieties:

'Companies don't care. Their interest is to sell.'

(Seed regulator, Arusha)

Major constraints to maize sector development

Ranking of issues mentioned	Karatu	Mbozi
Institutional capacity *(shortages, quality)*	21%	12%
Market problems *(limited/unreliable)*	20%	28%
Lack of knowledge *(among farmers)*	18%	25%
Environmental factors *(agro-ecological)*	17%	14%
Lack of capital among farmers	7%	3%
n =	138	80

% answers Karatu: Extension 27; NGO's16; Fertiliser co. 15; Seed co.14;
% answers Mbozi: Extension 28; Agro-dealers 16; NGO's 15;

Institutional capacity *(shortages, quality)*
- *shortage of extension services, processors, agro-dealers*
- *quality and timeliness of input provision (Mbozi), availability of (quality) seeds*

Lack of knowledge *(among farmers)*
- *on fertilizer use, seeds, soils*
- *on agronomy and markets (Mbozi)*

- Institutional capacity shortages seen as important in Karatu
- Lack of knowledge (among farmers) more stressed in Mbozi
- Market problems are more stressed in Mbozi

Understanding of yield gaps

(best performing - average farmers)

Yield estimates: (N=52)	**small** <2 ha	**medium** 2-4 ha	**large** >4ha
average farmer	1.9	3.1	4.8
best performing	3.4	4.9	6.5
yield gap	±56%	±65%	±73%

Explanations (Karatu: n=77; Mbozi: n=118)	**Total** n=195
not applying fertiliser T+R	14%
not using improved seeds	13%
lack of capital for inputs+labour	13%
knowledge on (maize) production	8%

- Similar views on average and best performing farmers in Karatu and Mbozi
- Larger farmers are seen as producing more intensively
- Yield gap increases with farm size
- Lack of knowledge not stressed as an explanation for yield gaps

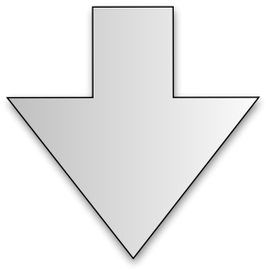
- lack of capital *(not knowledge)*, appears the major issue
- Labour issues *(references to timelines of land prep./seeding/weeding)*
- *Mbozi:* pest control appears to be an issue limiting yields
- *Karatu*: poor agronomic practices are mentioned (*spacing, row planting, following advice*)

Closing yield gaps

farmer views

Focus Group discussion, Mbozi: Gendered views on increasing maize productivity

- Female farmers:
  - knowledge provision on fertilizer, seeds, agronomy
- Male farmers:
  - capital (access to credit for inputs, implements, mechanization)
  - lower input prices.



greater market orientation in maize production
stress the need for:
- reliable markets
- higher grain prices
- better grain market policies

Note! participants were well-connected(wealthier) farmers

Perceptions of knowledge levels - *Karatu*

Karatu	fertilizer	seed & varieties	agron. practices	weed & disease	weather & climate	output markets
agro-dealers	++	++	+/-	+/-	+/-	+
seed co.	+	++	++	+	++	++
fertiliser co.	++	+/-	+	+	+	+
NGO's	+	+	+	+	+	+
farmers/groups	+/-	+	+/-	+/-	+/-	+
research	++	++	++	++	++	+
extension	++	++	+	+	+	+/-
financial institutions	-	—	—	—	-	++

- Research is highly valued - *its reach is limited (note! Karatu is a research site)*
- Knowledge levels generally decrease from left to right
- NGO's are valued source of knowledge *(reach?)*
- Traders, transporters, processors are only knowledgeable on output markets
- Agro-dealers are also knowledgeable on seeds *(unlike Mbozi)* — *seed sector presence?*

Perceptions of knowledge levels - *Mbozi/Momba*

Mbozi/Momba	fertilizer	seed & varieties	agron. practices	weed & disease	output markets	
agro-dealers	++	+	+/-	+	-	
seed co.	+	++	++	+	-	
fertiliser co.	++	+/-	+/-	-	—	
NGO's	++	++	++	+	+/-	
farmers (groups)	+/-	+	+/-	+	-	
research	+	+	+	+	-	
extension	+	+	++	+	+/-	
financial institutions	—	—	—	—	+/-	

- Knowledge is seen as vested in pvt. sector and NGO's *(different orientation in southwest TZ?)*
- Research and extension is valued, but less than in Karatu
- Extension is mostly knowledgeable on agronomic practices
- AMCOS, NFRA and exporters are also seen as knowledgeable on output markets
- Commercial farmers, when mentioned, are regarded as knowledgeable on all topics

Main messages to farmers

on fertilisers *(advice is generic):*
- not specific to farmer situation, but differs between info providers
- use fertiliser, timing, type, rate; some actors recommend soil testing

on seeds *(advice is generic)*:
- use improved DT, disease tolerant seeds, according to agro-ecological zone (incl. altitude)
- time of seeding advice;

on agronomic practices:
- line sowing, spacing (plant density), timing of seeding (early), timely weeding
- to a lesser degree mentioned: rotations, disease control, irrigation, soil management

on weed & disease mgt. *(stress is on weeding):*
- timely weeding, use of herbicides, use of tolerant varieties, pesticides

on weather & climate *(limited advice given)*:
- adapted varieties, CSA, timely planting, 'listen to weather forecast'

on markets *(limited advice given by public sector)*:
- try to get market info (prices and where to sell), produce quality, post-harvest handling

Differentiation of farmers in categories and messages (limited)

Knowledge network — *stakeholder linkages*

- Knowledge exchange public—private sector stakeholders is limited *(and limited to input side)*
- Research has no direct knowledge exchange links with agro-dealers *(but with extension, NGOs)*
- Government research extends knowledge directly to farmers
- Farmer groups have better access to extension than individual farmers

Karatu:

- Research-extension-farmer main knowledge exchange mechanism
- value farmer — public sector links > farmer — private sector links

  farmer distrust of private sector?

Mbozi/Momba

- farmer — private sector links: most numerous (strong)
- private sector — farmer links: more numerous, higher valued
- gendered knowledge provider access (pvt sector / public ext)

  (male) farmers: stronger linked to private sector

Who are your sources of knowledge on…?

Topic (freq) (n=472)	(1)	(2)	(3)	most preferred
seed & varieties (109)	seed co (50%)	research (20%)	agro-dealer (13%)	**seed co./research**
fertilizer (107)	fertiliser co. (36%)	research (18%)	distributor (13%)	**research, fertilizer co**
agron. practices (78)	research (37%)	extension (23%)	NGO (14%)	**research**
weed & disease (70)	research (27%)	extension (17%)	agro-ch. co (17%)	**research**
output markets (70)	traders (31%)	media (24%)	processor (9%)	**traders**
weather & climate (38)	met. dept. (37%)	media (32%)		**regulator, met dept.**

- *agronomic practices:* private sector not mentioned much
- *markets*: ICT services (sms) hardly mentioned
- appreciation is highest for: *research, extension* and *fertiliser co's*
- notably, appreciation of *NGO's* is low.
- appreciation of topics: (1) agron. practices, (2) weed & disease; (3) seed

Seeking information through what channels?

ranking

Order of importance

TV	written media	radio	internet	phone

- *Note: we interviewed educated, well connected service providers (few farmers)*
- internet is a more important source of info for Mbozi stakeholders
- smart phone is a relatively more important in Mbozi than Karatu
- Local & district extension are most actively seeking info *(TV most important)*
- Agro-dealers (n=3) are also pretty active, but do not use phones or internet

Conclusions - Tanzania

- Lack of knowledge hampers yield increase, yet market problems main concern
- Market environment: interest in yield-enhancing investments likely to be limited
  cost-reducing technologies/practices may be more attractive
- Gendered routes to increased productivity: *Targeting?*
- Limited capacity/reach of research/extension: *An expanding role for agro-dealers?*

- Government research is preferred source of reliable knowledge
- Agro-dealers' role as knowledge providers limited (to fertiliser / seeds / Mbozi)
  Shop-owners are considered knowledgeable, but their staff not (in Mbozi/Mbyea).
- Seed companies' role in knowledge provision is limited
  Perception: little interest in info. provision, providing quality seeds, main interest, is selling seed
- Knowledge (sources) differ per domain
  (+) *Fertilizer seed, agronomic practices, weed & disease*
  (-) *Climate and weather information, output market information*

Conclusions & Recommendations

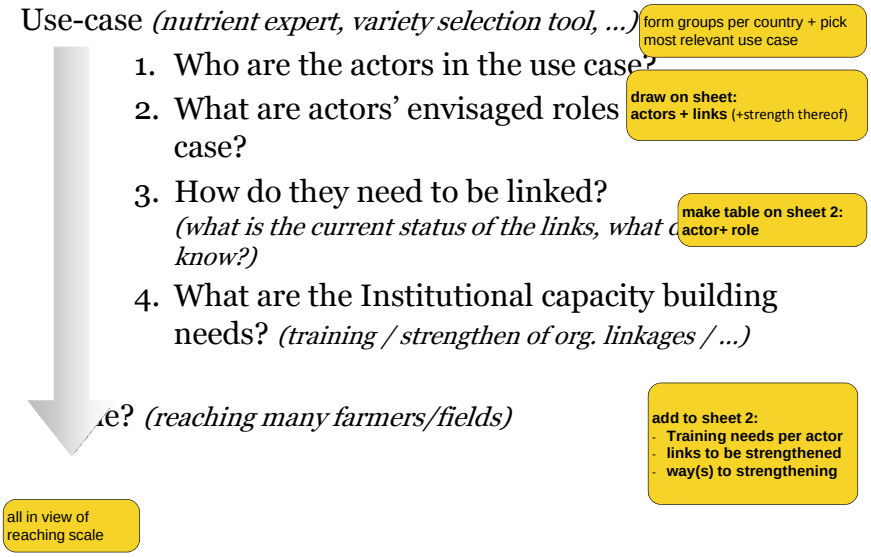
- KNA + KAP enable TAMASA to:
  - Prioritise the development of different use cases;
  - Identify partners for the co-development of use cases;
  - *Identify/target service providers, and capacity building needs (in NARES)*;
- Repeat in Ethiopia, Nigeria - *stronger focus on priority use-cases?*
- Develop a stronger focus on tool hosters/users? *(ACAI example)*
- …

Thank you for your interest!

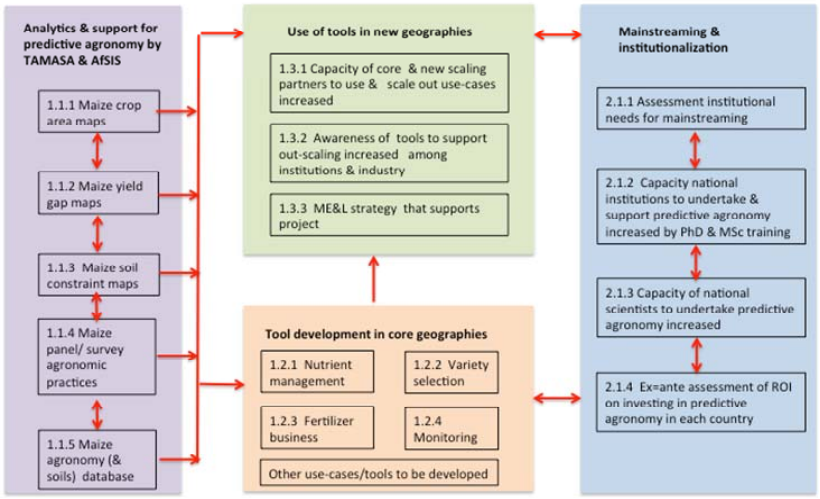
Use-case (nutrient expert, variety selection tool, …)

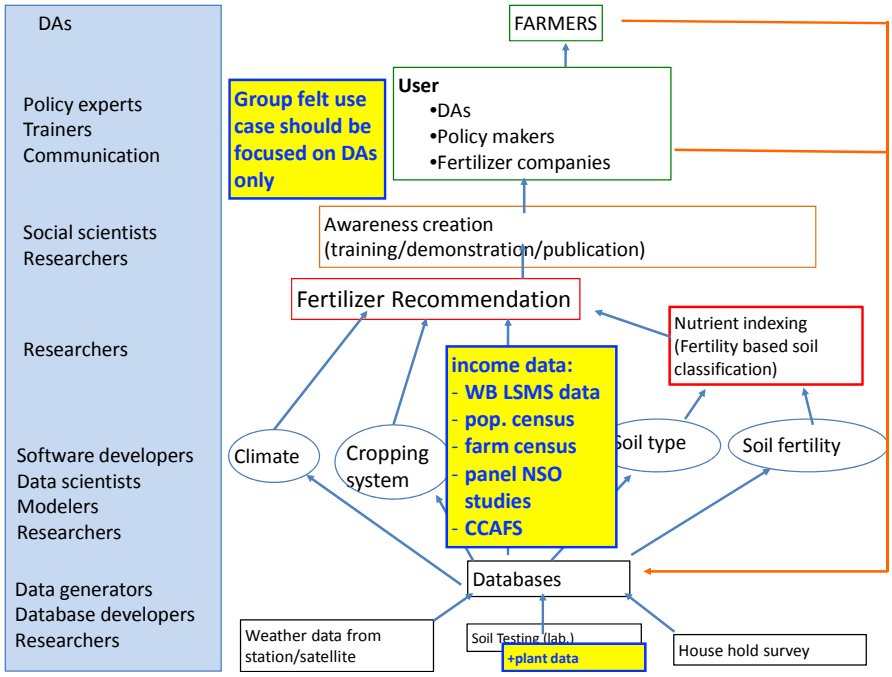
1. Who are the actors in the use case?
2. What are actors' envisaged roles in the use case?
3. How do they need to be linked? (content of the links) *(what is the current status of the links, what do we still need to know?)*
4. What are the institutional capacity building needs? *(training / strengthen of org. linkages / …)*

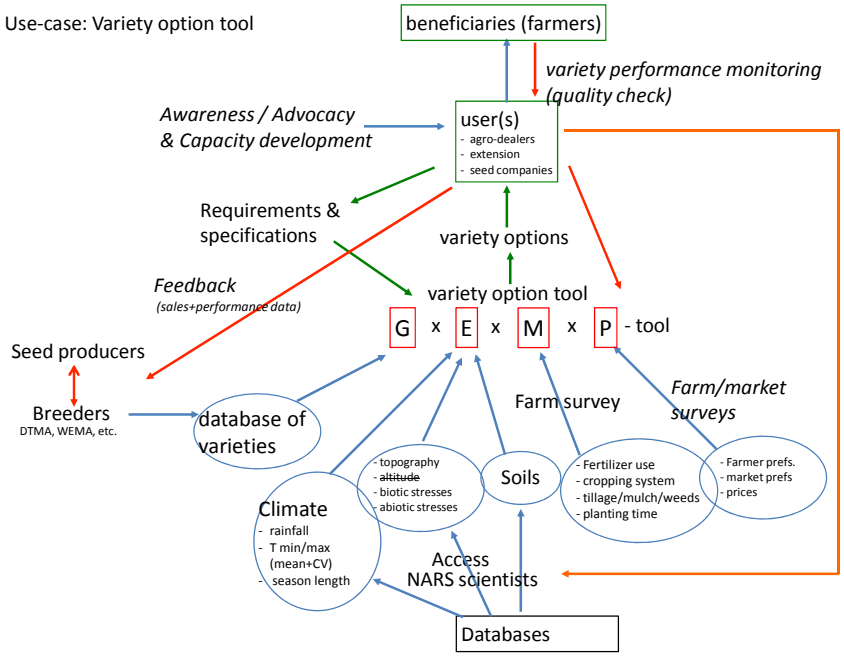
Scale? *(reaching many farmers/fields)*



TAMASA Workstreams/Outputs


Analytics & support for predictive agronomy by TAMASA & AfSIS
1.1.1 Maize crop area maps
1.1.2 Maize yield gap maps
1.1.3 Maize soil constraint maps
1.1.4 Maize panel/ survey agronomic practices
1.1.5 Maize agronomy (& soils) database
Use of tools in new geographies
1.3.1 Capacity of core & new scaling partners to use & scale out use-cases increased
1.3.2 Awareness of tools to support out-scaling increased among institutions & industry
1.3.3 ME&L strategy that supports project
Tool development in core geographies
1.2.1 Nutrient management
1.2.2 Variety selection
1.2.3 Fertilizer business
1.2.4 Monitoring
Other use-cases/tools to be developed
Mainstreaming & institutionalization
2.1.1 Assessment institutional needs for mainstreaming
2.1.2 Capacity national institutions to undertake & support predictive agronomy increased by PhD & MSc training
2.1.3 Capacity of national scientists to undertake predictive agronomy increased
2.1.4 Ex=ante assessment of ROI on investing in predictive agronomy in each country


DAs
Policy experts
Trainers
Communication
Social scientists
Researchers
Researchers
Software developers
Data scientists
Modelers
Researchers
Data generators
Database developers
Researchers
FARMERS
Group felt use case should be focused on DAs only
User
•DAs
•Policy makers
•Fertilizer companies
Awareness creation (training/demonstration/publication)
Fertilizer Recommendation
Nutrient indexing (Fertility based soil classification)
income data:
- WB LSMS data
- pop. census
- farm census
- panel NSO studies
- CCAFS
Climate
Cropping system
Soil type
Soil fertility
Databases
Weather data from station/satellite
Soil Testing (lab.)
+plant data
House hold survey



Data Management

by

H. Tonnang (CIMMYT), & J. Adewopo (IITA)

Data Sources and Initiatives

by

TAMASA DATA COLLECTION AND MANAGEMENT PLANNING

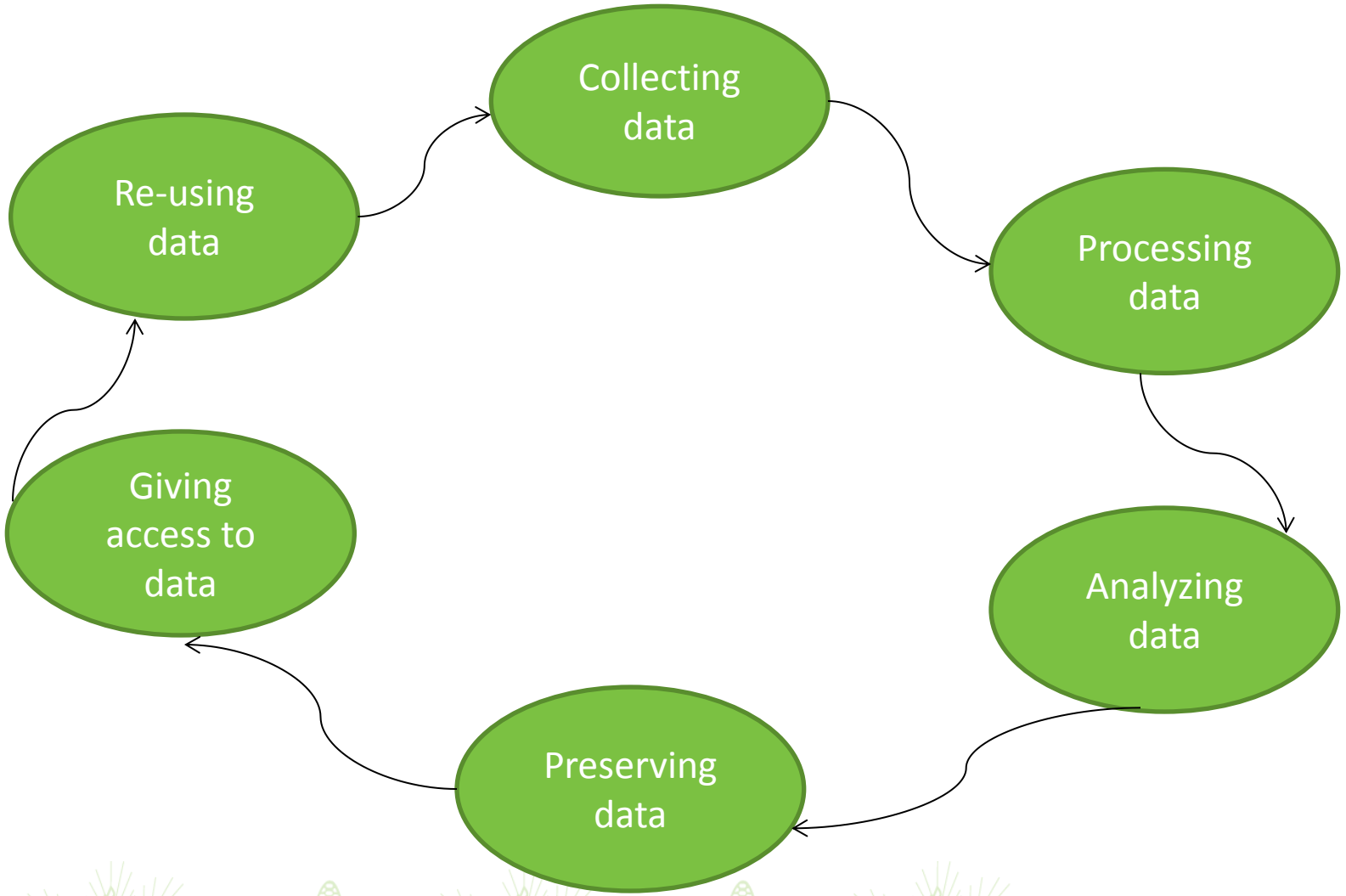
H. Tonnang/ J. Adewopo

CIMMYT MR

PUSPOSE

A data management and sharing plan will help us design and planned, how data will be managed during the project lifespan and shared afterwards with wider community

Data Life Cycle



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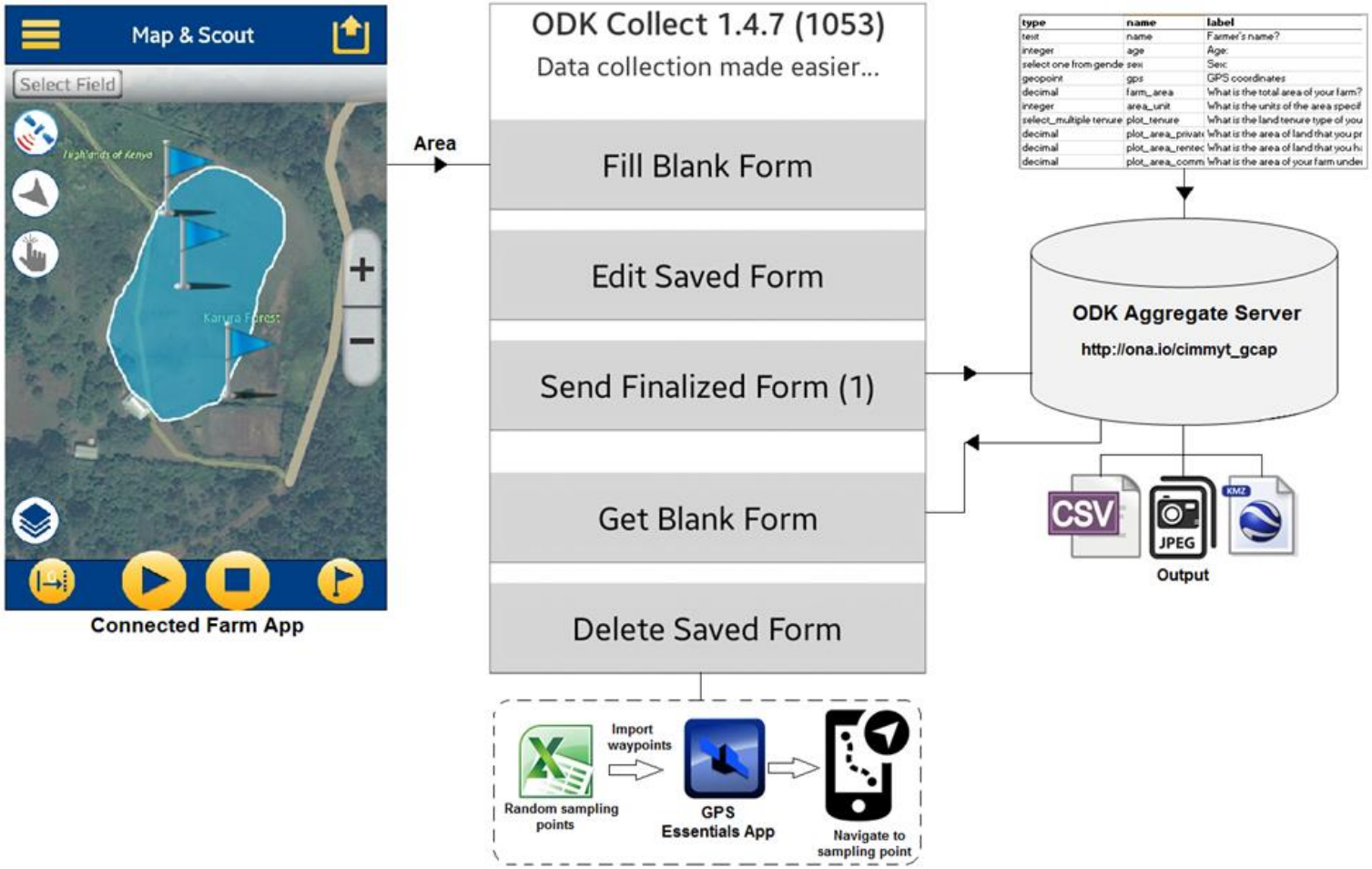
DATA collection

TAMASA data collection cycle



ODK

- **O**pen **D**ata **K**its
- Is a modular and extensible android based app that allows for **design**, **capture**, **aggregation** **{geo}visualization** of mobile based surveys
- Works together with form generators and data visualization apps to allow for design, capture, analysis and visualization of mobile surveys

Three Key Parts

- **Build**
  - Creating forms
- **Collect**
  - Android app
  - Download forms/collect data
  - Upload data
- **Aggregate**
  - Store data (Google AppEngine or webserver)
- **{ODK Briefcase}**
  - Form and data transfer across ODK servers

Build {Designing forms}

	A	B	C
1	type	name	label
2	start	start	
3	end	end	
4	today	surveyDate	
5	deviceid	deviceid	
6	begin group	Section_A	Farmer (Respondent) characteristics
7	text	ename	Enumerator's name?
8	select one from region	region	In which region is this survey being carried out?
9	note	region_selected	You chose: ${region}
10	select one from district	district	In which district is this survey being carried out?
11	text	ward	In which ward is this survey being carried out?
12	text	village	In which village is this survey being carried out?
13	text	locality	In which locality (mtaa) is this survey being carried out?
14	text	fname	Farmer's name?
15	integer	age	Age:
16	select one from gender	sex	Sex:
17	text	plotId	Assign a plot ID
18	select one from tenure	plot_tenure	What is the land tenure type of this plot?
19	decimal	plot_area	What is the area of the plot (Farmer estimate)?
20	select_multiple asset	asset	Do you own any of the following assets?
21	text	asset_other	If other asset type, please explain?
22	select one from yes_no	hh_ownership	Does the household own the main house they stay in?
23	integer	hh_rooms	Total number of rooms in the main house the respondent stays in?
24	select one from wall_type	wall_type	Major material of external walls of the main house the respondent stays in?

Build {Designing forms}

- **Surveys** can be designed in Ms Excel and then converted to XSForms (xml) through websites like formhub.org or ona.io
- Allows for different data types e.g integer, decimal, text, photo, dates, list etc
- Allows for cascading and conditional loops

{Designing forms}-Data Types

- Text
- Integer
- Decimal
- Date
- Image
- Geopoint, geoshape, geotrace (Spatial)
- Barcode
- Video
- Audio

ODK and Formhub

Survey Design	Data Collection	Data Analysis
• XLSForm • https://formhub.org • https://ona.io • http//mobilesurvey.qed.ai	• Formhub.org • Android mobile • Web page • Tablets • phablets	• Formhub.org • Download to spreadsheet • Visualize maps

Export, map and view submissions

Published Forms Export, map, and view submissions.

Show inactive: Sea

Name	Submissions	Enter Data	View	Download
TAMASA_FarmCharacteristics CREATED: June 10, 2015	0	Web		
TAMASA_GrainYieldSurvey CREATED: June 16, 2015	0	Web		
TAMASA_PanelSurvey_Ethiopia CREATED: June 10, 2015	0	Web		
TAMASA_VegetativeStage CREATED: June 10, 2015	0	Web		

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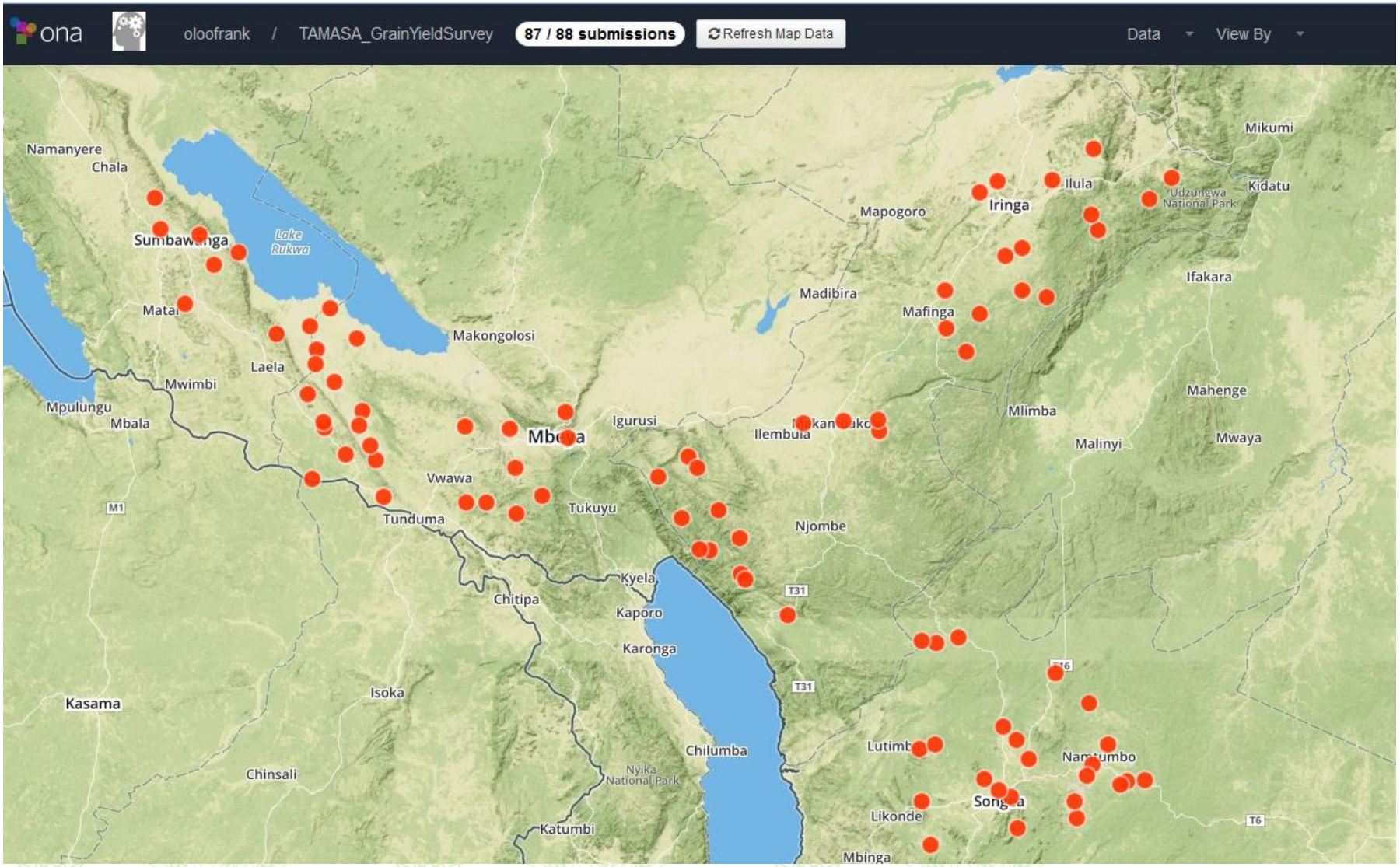
Geo-visualization of submissions



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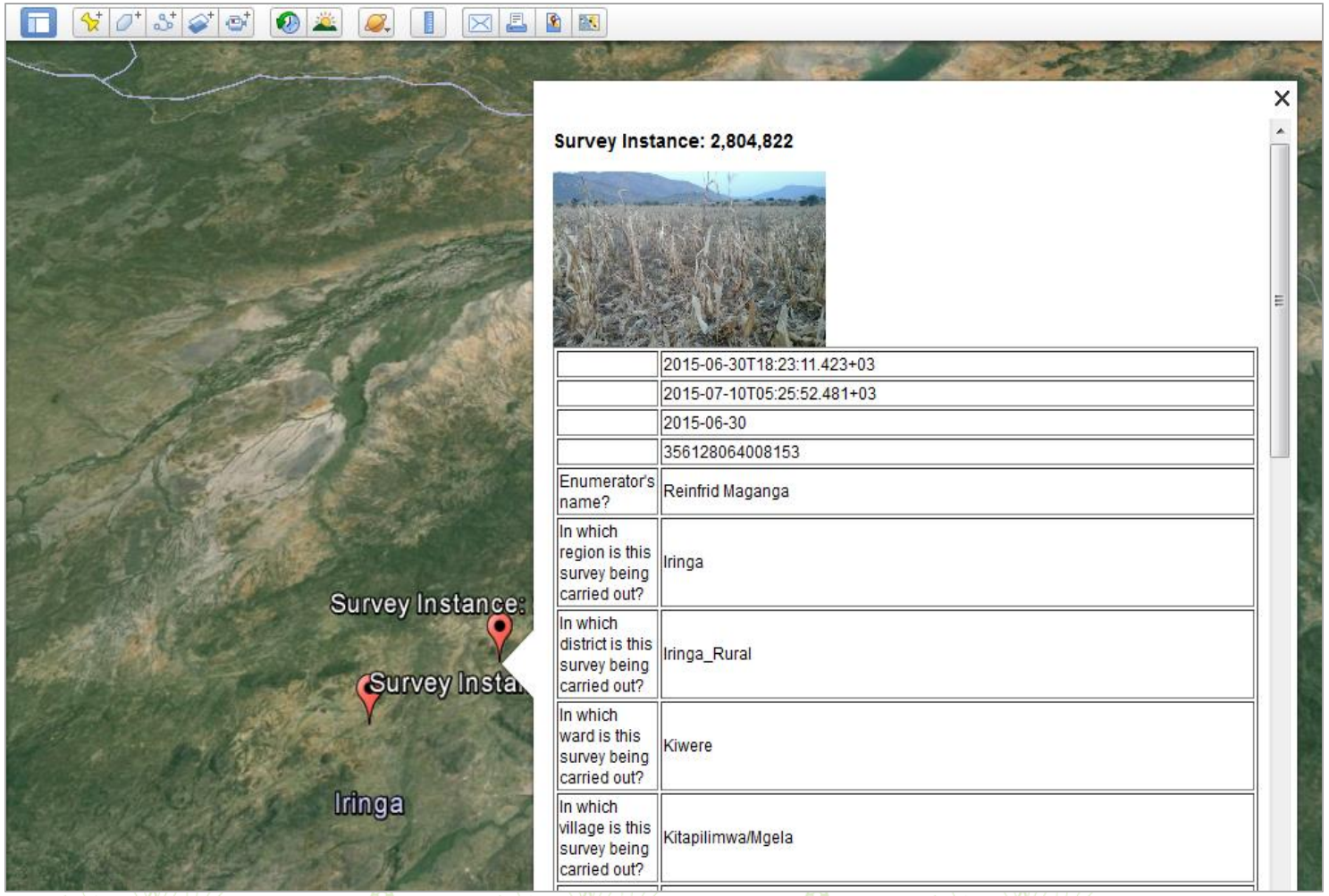
Point location visualization of submission



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Configuring ODK Collect

1. Download and install ODK Collect from Google Play Store onto Android device.
2. Click on General Settings (this may require clicking a particular button on your android device; on top right of of the ODK Collect interface)
3. Click on "Configure platform settings“
4. Change the URL to: Here include the server name
5. Change username to: optional
6. Change password to: optional
7. Return to the main ODK menu.
8. Click on "Get Blank Form“
9. Select the **form :** Tamasa GrainYieldSurvey TAMASA Soil Sample, TAMASA FloweringStage form, and click "Get Selected.“
10. Return to the main ODK menu, and click "Fill Blank Form".
11. Select the TAMASA_GrainYieldSurvey form, and fill it out.
12. Later you can select "Send Finalized Form". Then the data is stored into the database (URL).

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Useful links

- ODK/Formhub servers
  - https://ona.io
  - https://formhub.org/
  - https://odk.ona.io
- Barcode generator
  - http://tag.kutabiri.com/

ODK Collect

Interface

In this main interface, you can

1. Configure the server settings accessing blank survey forms and for aggregating completed surveys
2. Getting blank forms: Accessing blank ODK forms
3. Filling Blank Forms: Actual data collection using ODK forms
4. Edit Saved Form: before sending
5. Sending Finalized form

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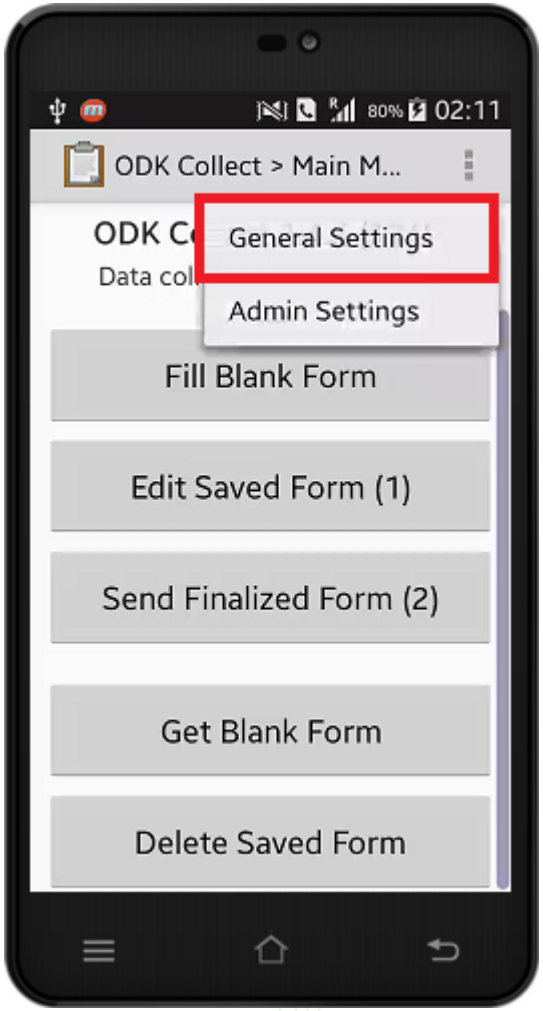
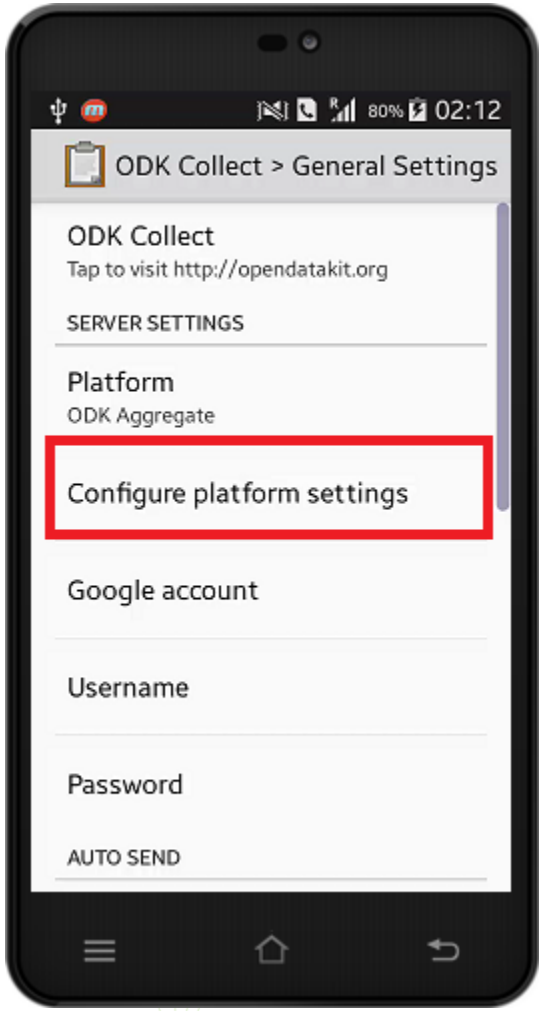
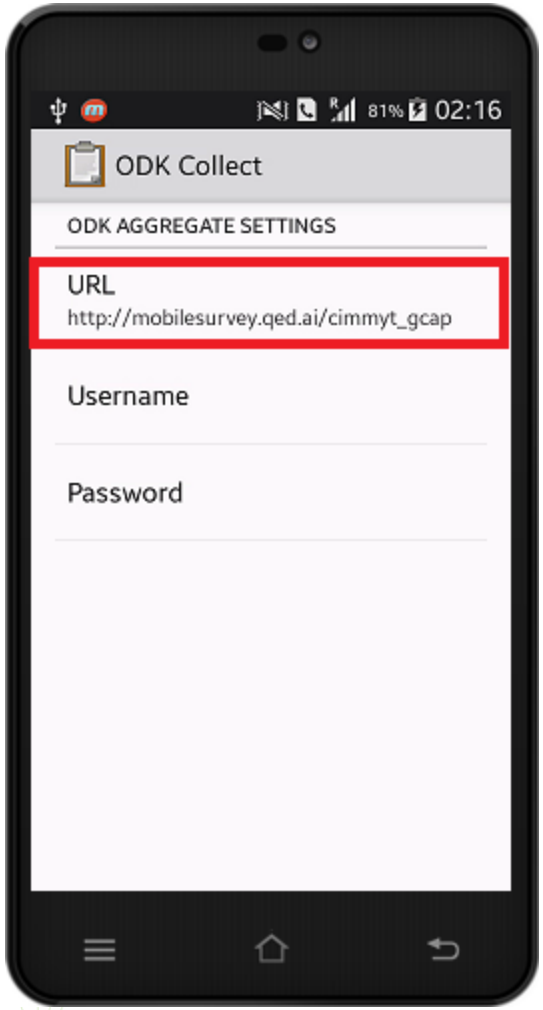
Configuration

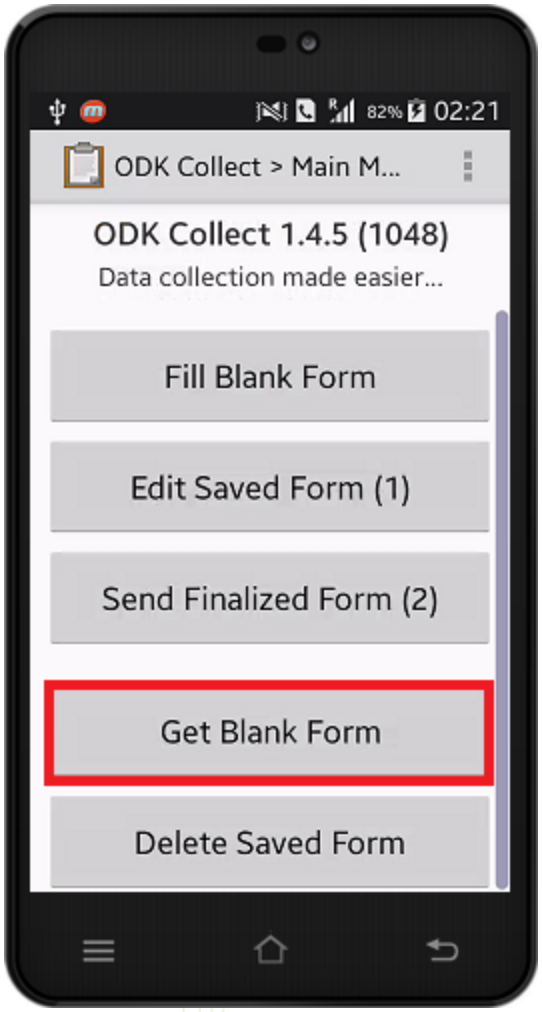






Set URL to http://mobilesurvey.qed.ai/cimmyt_gcap, ignore Username and Password

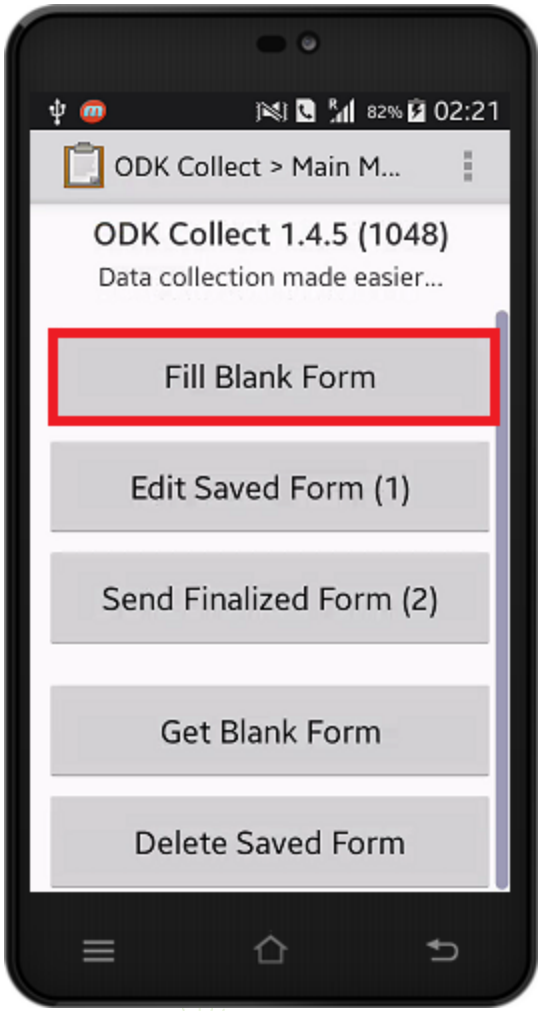
Get blank forms



- Go back to the main interface
- Click on the Get Blank Form menu
- In the subsequent list, select the forms of interest and click on Get Selected
- In this training select,
  - TAMASA_FloweringStage_Updated
  - TAMASA_GrainYieldSurvey_Updated
  - TAMASA Soil Sample
  - VegetativeStageSurvey_Nigeria

CIMMYT

Fill forms



- Go back to the main interface
- Click on the Fill Blank Form menu
- In the subsequent list, select a form of interest and start filling
- At the end of the survey Save and Exit survey
- Before leaving the field you can check and correct any entries about the form

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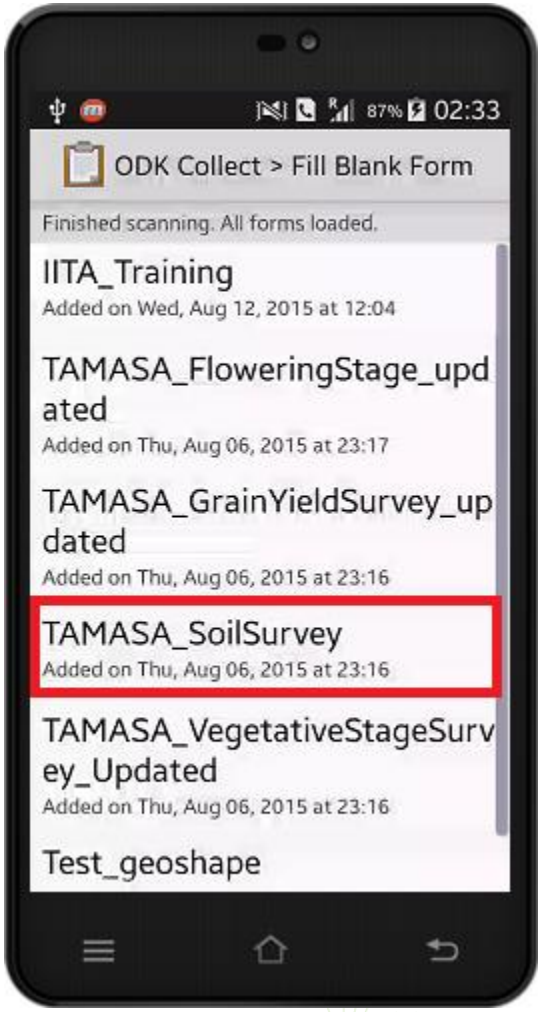
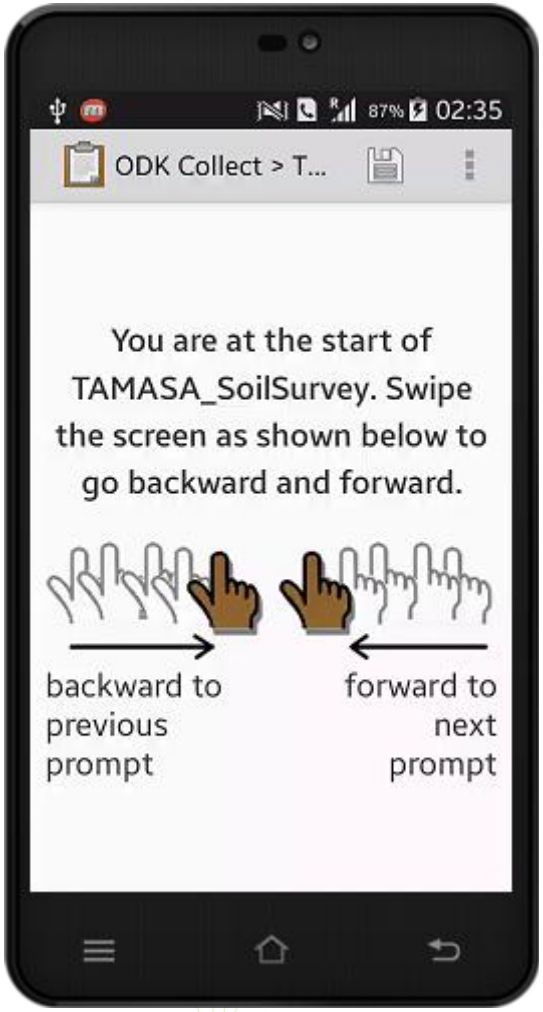
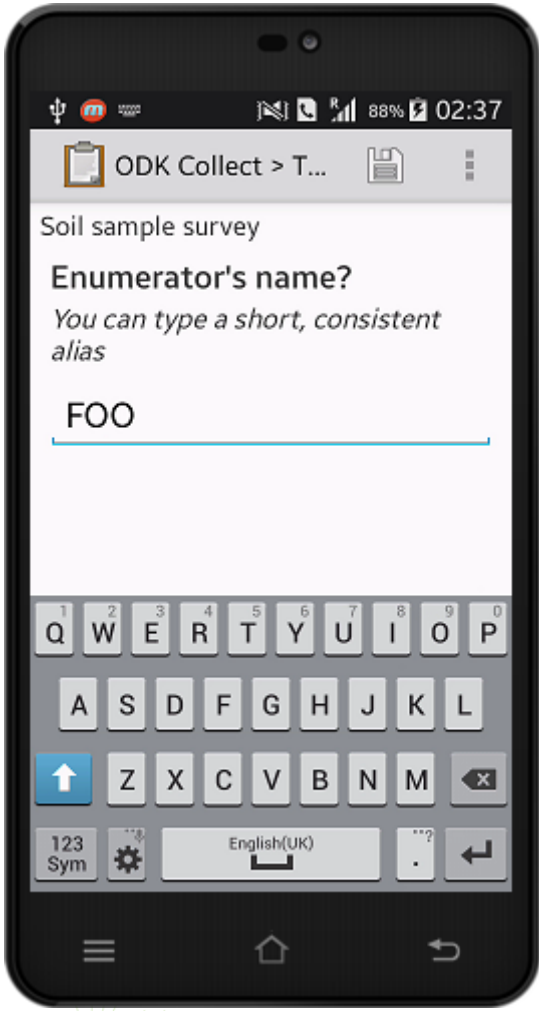
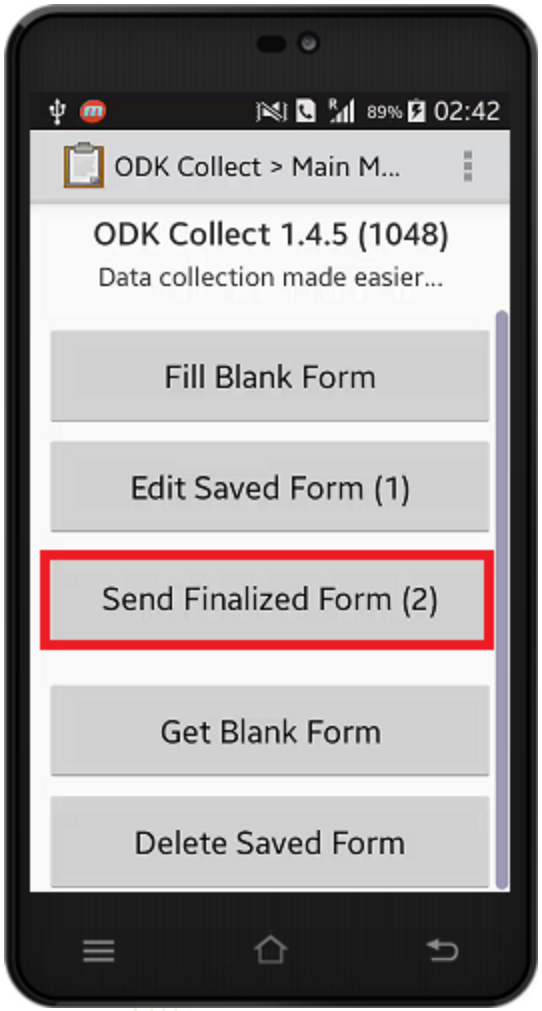
Fill forms

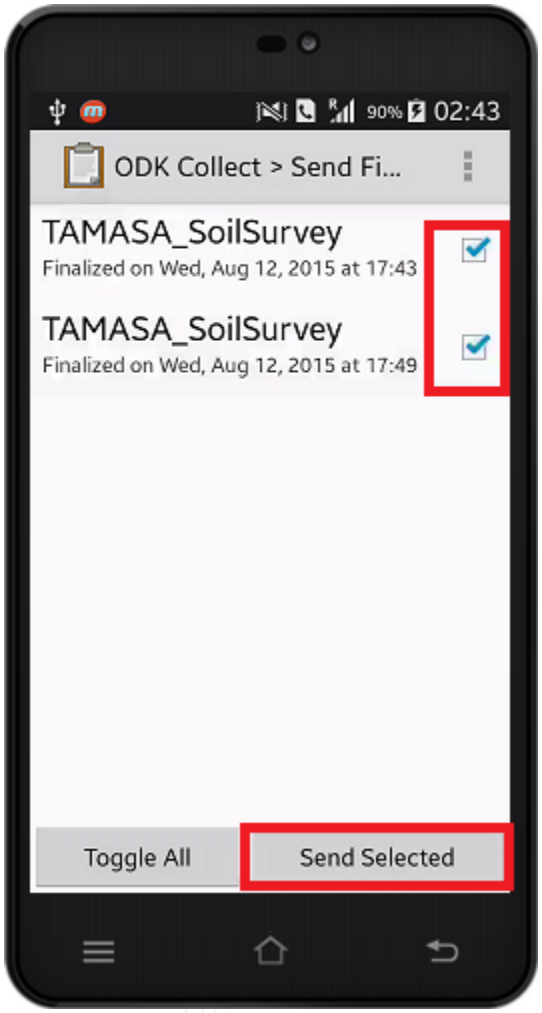

87% 02:33
ODK Collect > Fill Blank Form
Finished scanning. All forms loaded.
IITA_Training
Added on Wed, Aug 12, 2015 at 12:04
TAMASA_FloweringStage_updated
Added on Thu, Aug 06, 2015 at 23:17
TAMASA_GrainYieldSurvey_updated
Added on Thu, Aug 06, 2015 at 23:16
TAMASA_SoilSurvey
Added on Thu, Aug 06, 2015 at 23:16
TAMASA_VegetativeStageSurvey_Updated
Added on Thu, Aug 06, 2015 at 23:16
Test_geoshape


87% 02:35
ODK Collect > T...
You are at the start of TAMASA_SoilSurvey. Swipe the screen as shown below to go backward and forward.
backward to previous prompt
forward to next prompt


88% 02:37
ODK Collect > T...
Soil sample survey
Enumerator's name?
You can type a short, consistent alias
FOO
English(UK)

Send finalized forms





Select the finalized surveys to send and click on Send Selected

CIMMYT

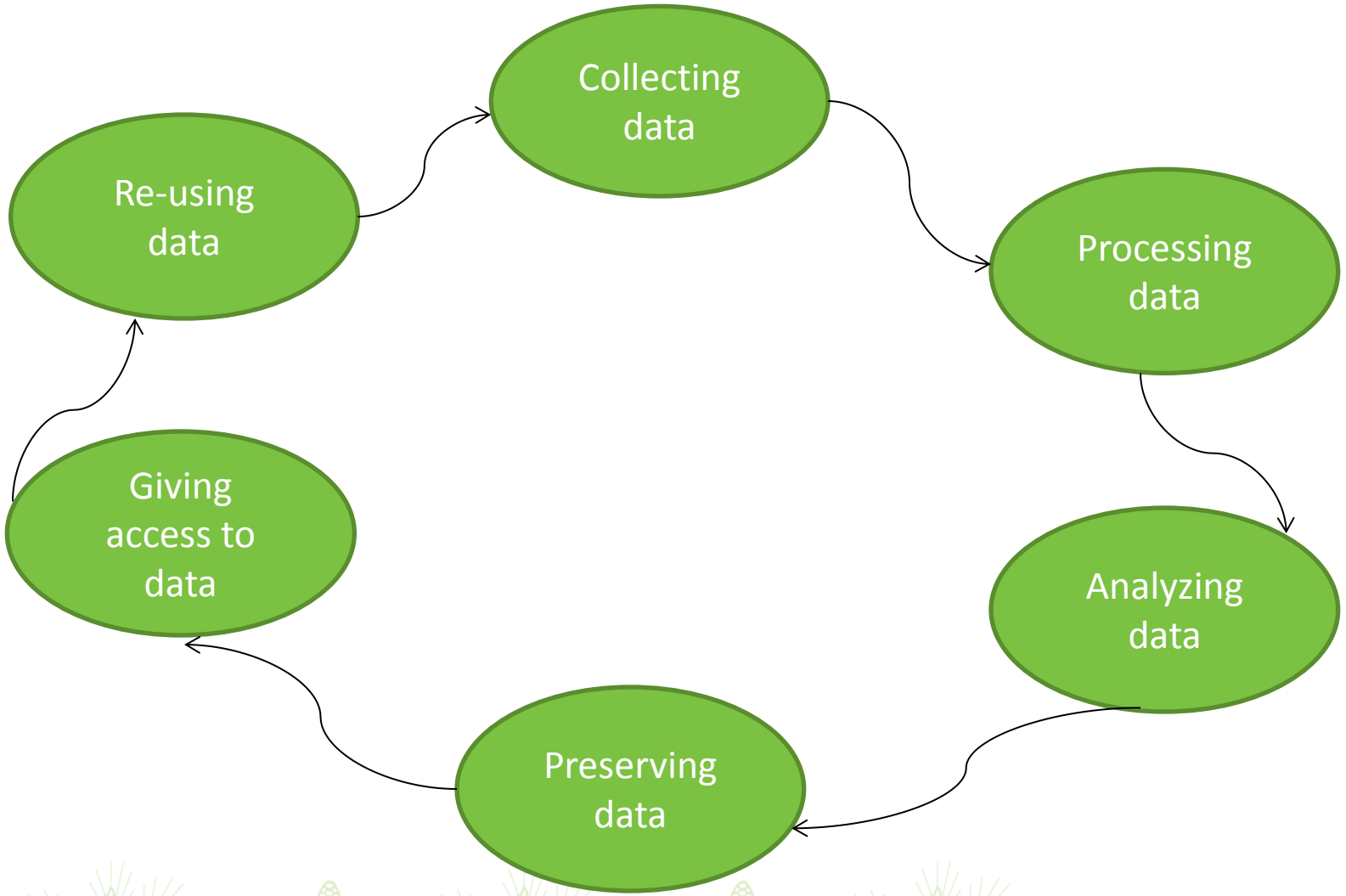
Why app in TAMASA?

- Efficient
- Standardized
- Interoperability
- Allow for crowd sourcing
- Analysis and visualization in different platforms
- Facilitate quality control

Why data management for TAMASA?

- Comply to donor requirements
- Data products should be made publicly accessible
- Enhance data sharing, access
- Lay foundation for our institutions memory
- Follow best practice for QA/Data cleaning
- Organize files and backups & storage
- Security of data
- Comply with dissemination standards and formats

Data Life Cycle



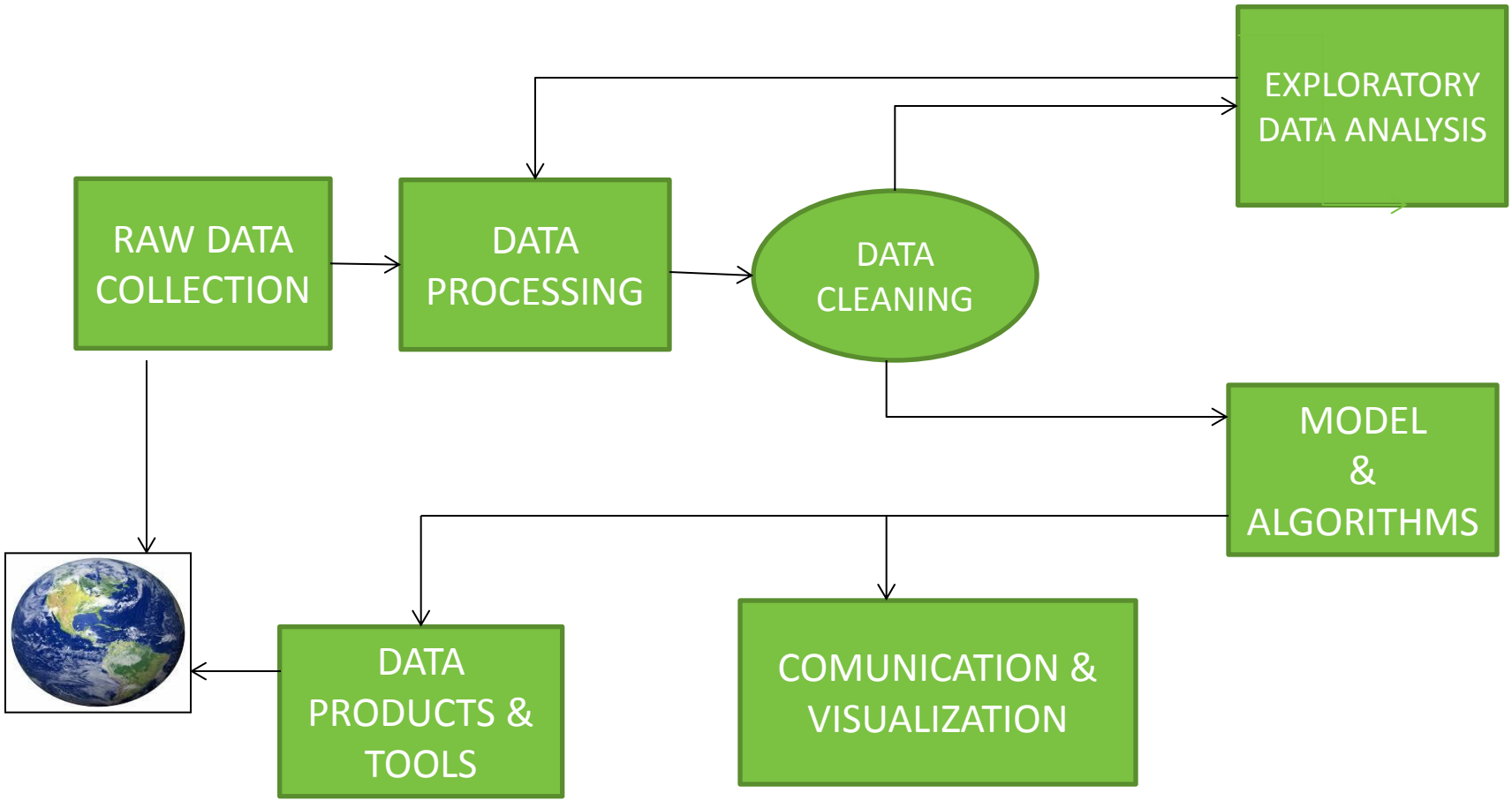
CIMMYT

Some Data Repository Tools

Esri Geoportal Server

CIMMYT

DATA PROCESS FLOW



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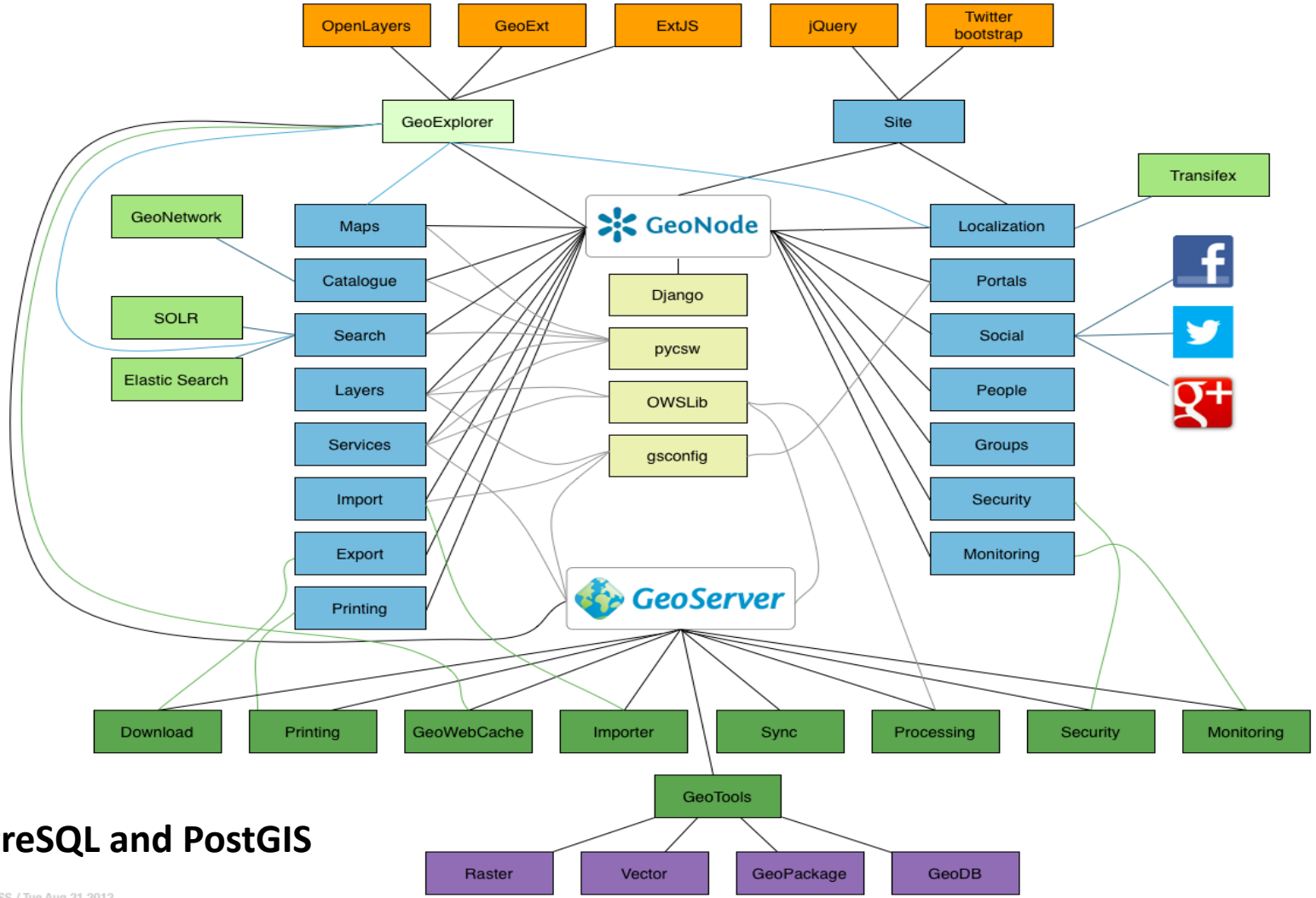
GeoNode



PostgreSQL and PostGIS

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http://maps.virtualkenya.org/

Layer from vkadmin, 2 weeks, 5 days ago
No abstract provided
120 views | 1 download | Average rating (0 votes) | Download | Create a map

◇ test2
Layer from vkadmin, 2 weeks, 5 days ago
No abstract provided
117 views | 3 downloads | Average rating (0 votes) | Download | Create a map

◇ test
Layer from vkadmin, 2 weeks, 6 days ago
No abstract provided
150 views | 0 downloads | Average rating (0 votes) | Download | Create a map

◇ kwale_adaptivecapacity
Layer from vkadmin, 3 months, 4 weeks ago
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◇ turkana_exposure
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No abstract provided
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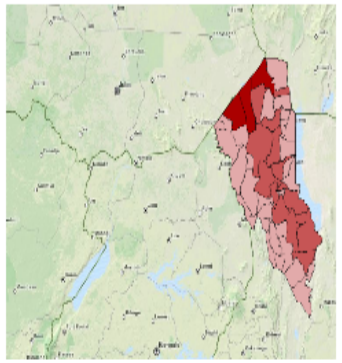
KWALE MAP - CLIMWARN
Map from vkadmin, 4 months, 1 week ago
407 views | 0 downloads | Average rating (0 votes)
Download | View



TURKANA MAP - CLIMWARN
Map from GSI, 5 months ago
464 views | 0 downloads | Average rating (0 votes)
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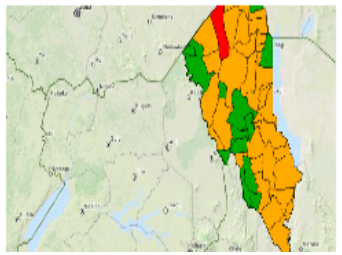

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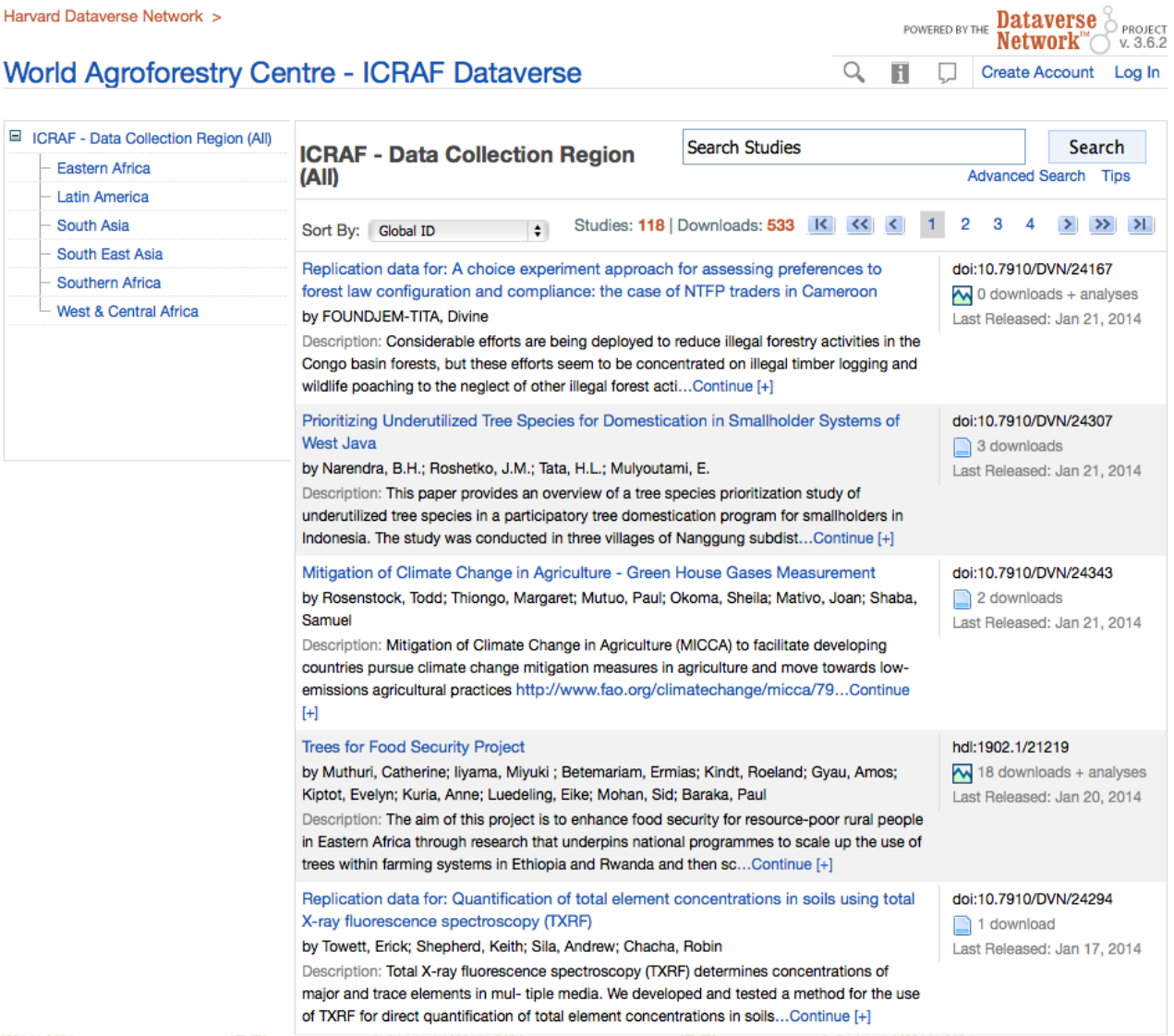
Dataverse



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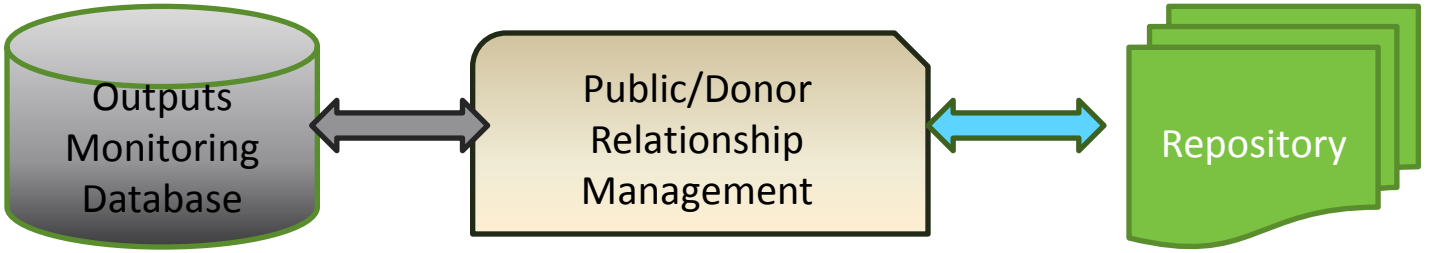
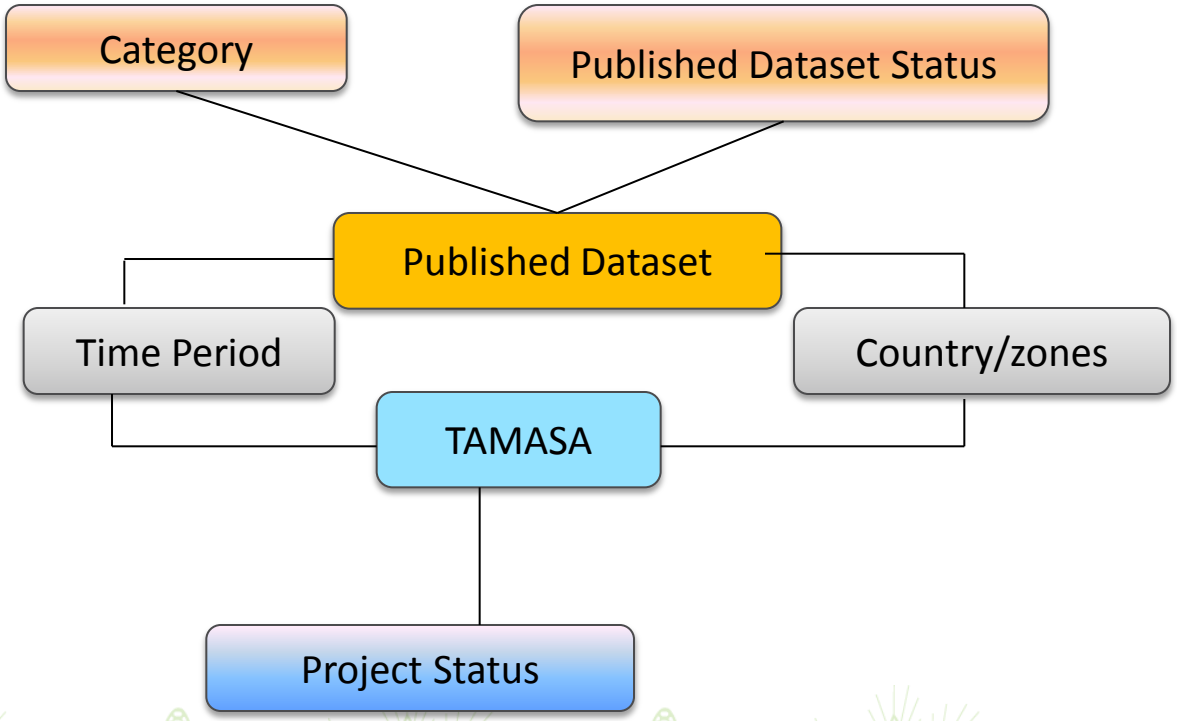
Establishing Data Outputs M&E





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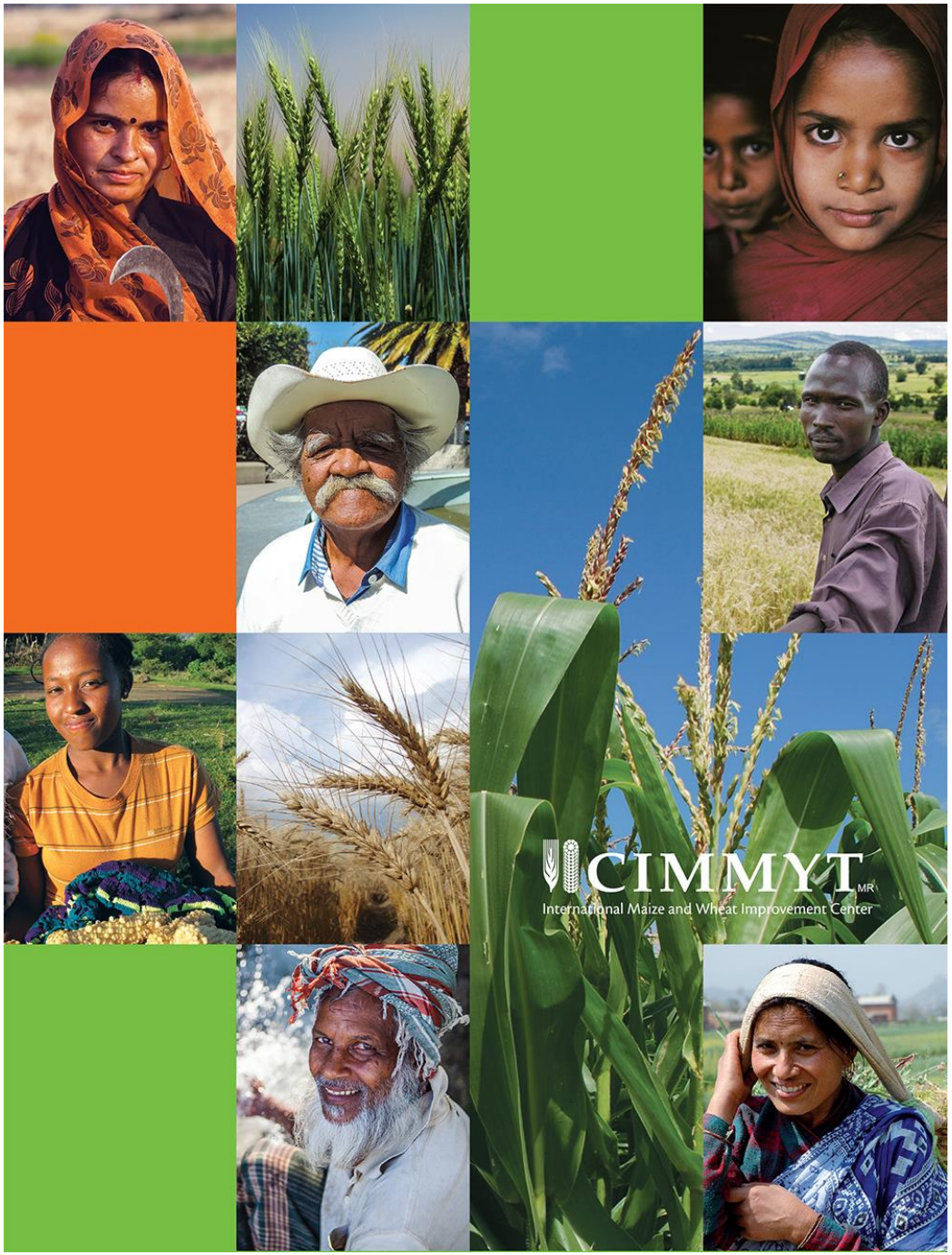
Keys Discussion Points

- Assign roles and responsibilities to relevant parties
- Metadata formats (how do we want to present our data?
- What level of desegregation should we adopt?
- After processing the data what should be the time span before making it public?
- Which database tools shall we used?
- Where to store the data? Data verse? GeoNode? Or both.? Or any please specify?
- What is our publication strategies?



Thank you for your interest!

100 DAYS at CIMMYT

J.B. Adewopo (IITA, Nigeria)

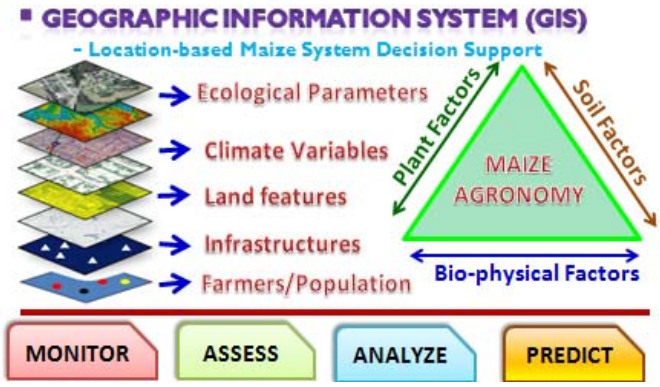
1. Introduction – Quick Background

- Joined TAMASA in June, 2015
- Supporting geospatial (and related) capabilities for maize agronomy in Nigeria (and at large)
- Developing partnerships for project deliverables on weather and geospatial aspects

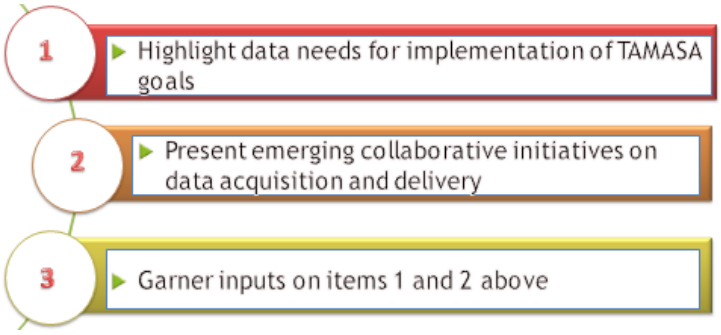
2. Maize Agronomy – The Target

- Joined TAMASA in June, 2015
- Supporting geospatial (and related) capabilities for maize agronomy in Nigeria (and at large)
- Developing partnerships for project deliverables on weather and geospatial aspects

3. Maize Agronomy – GIS and Maize



4. Goal of the Session

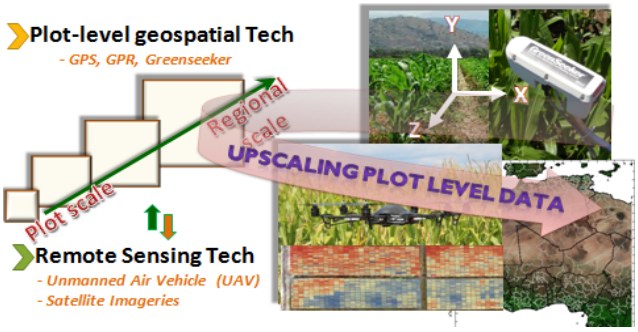


5. Data – (and sources)

- Plot/Field level (NOT, Baseline Survey, Panel Survey; GPS Mapping)

- Spatially explicit (Remotely sensed products, UAV)
- Ancillary (Panel Survey, Weather Stations)

6. Data Needs – Upscaling



7. Status – (Quick Check)

Currently (in Nigeria)

- Coordinates acquired**
- Boundary traversing planned
- Multi-temporal LC datasets (NASA Reverb Portal)
- Fine resolution aerial imageries - EB1-UAV
- Weather stations (ordered)** Location??

Question: What is the status in ET and TZ? And what are the challenges?

8. Collaborative Initiative

- SoilDoc Kit and ICRISAT Initiative
- Kukua Weather Service Initiative
- TAMASA Automated Weather Network (TAWN)

9. SoilDoc

- SoilDoc Kit (A lab-in-a-box)
- Mobile soil fert. assessment kit
- Earth Institute Columbia
- Test soils on the farm |
  - Upload data to the cloud |
  - Create fertility maps|
  - Make recommendations |
  - Share that information |
- *** fertilizer blenders, seed companies, traders, etc.

10. ICRISAT STARS

- ICRISAT STARS Project
- BMGF- funded to acquire aerial imageries of croplands in Mali and Nigeria.
- Goal: Build robust spectral library for crops
- Monitoring and assessment (productivity and crop health parameters).

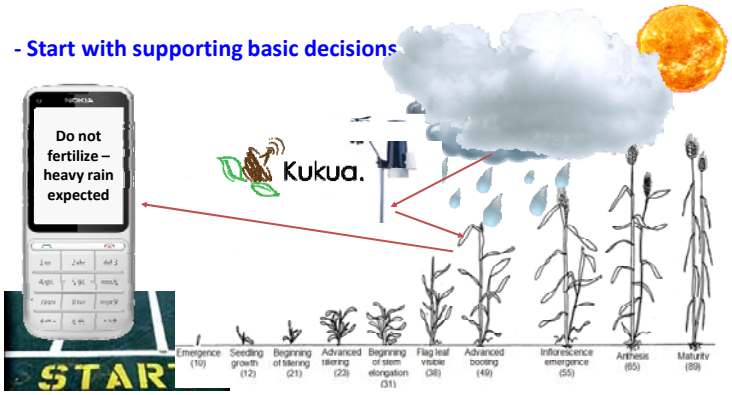
UAV Flight Mission at Kofa, Kano

11. Kukua Weather Data/Services

- **Kukua Weather Services**
  - Goal: Provide accurate weather data and forecasts in Africa – target Farmers
  - Secured €100, 0 rom EU – 1st phase: 2nd phase @ €250, (
  - Partner: Finnish ather forecasting company (Forec Weather Products and forecast servic
- Weather Stations disc. @ ~$600/ea (reg. @ ~$2000/ea) …..**strings attached!**
- To provide ~20 – 30 free weather stations to TAMASA-NG …..**strings attached!**

Kukua.

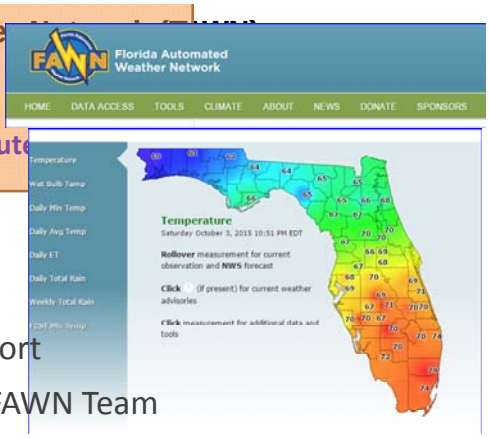
12. Partnership for Weather Data/Services



13. Partnership for Weather Data/Services

- TAMASA Automated Weathe
  - One-stop online platform – Stations
  - Real-time | minute-by-minute visualization and access |
- Prototype: **FAWN**

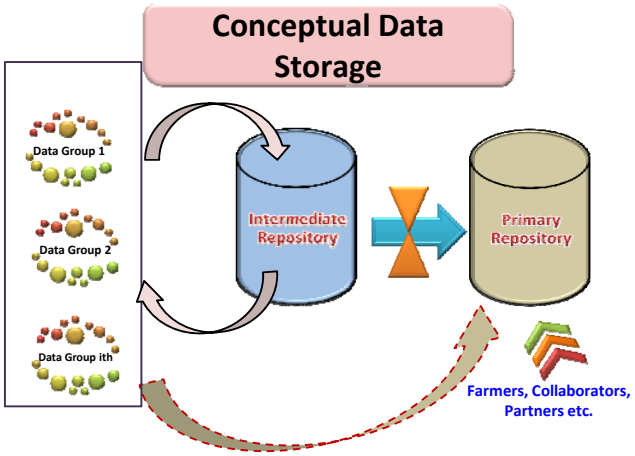
  www.fawn.ifas.ufl.edu
- IITA GIS Team – Dev. Support
- Ongoing discussion with FAWN Team



14. Questions for Discussion

- For Nigeria, no historical daily records exist on weather at NOT locations BUT this is needed for predictive maize agronomy e.g. DSSAT; How do we address this constraint? (Stochastic weather generator?, any existing repository?)
- What are the pivotal needs that should be addressed through Kukua partnership? What commitments can TAMASA make? Can we implement this for the 3 Countries? - Complications??
- Given existing project implementation structure, how can we optimally deploy weather stations and where are the potential locations in each Country?
- Who are the potential users of weather data and what is the most desirable temporal resolution?
- What are the metrics that can be used to measure impact of deploying weather data services? (Papers published, subscribed users, number of downloads, agronomic practices enhanced etc)

Conceptual Data Storage



Opportunities for scaling-out without Collaborators and New Partners (with a focus on Nigeria)

by

A.Y. Kamara (IITA, Nigeria)

- TAMASA seen as a multi-stakeholder platform in each country
- Do we have all the stakeholders or the right partners
- List other partners and opportunities for bringing them to the platform
- List of other initiatives for taking maize technologies to scale in Africa
- What lessons do we learn from other institutions using similar tools such as rice advice

Summary Reflections from Presentations

Schedule of Events

Day 1,
Tuesday, October 13, 2015
Morning Session

Tuesday 13			Time
0830-0900	Registration	P. Ifeanyi	
0900-0915	Welcome & Meeting Objectives	P. Craufurd	15
0915-1000	Overview TAMASA	P. Craufurd	45
1000-1045	Tea/Coffee Break/Photo Session		
Presentation Session 1 Chair – Prof. Sani Miko (SG2000, Nigeria) Rapporteurs – Julius Adewopo, Postdoctoral Fellow/Geospatial Analyst, Nigeria			
Progress in Year 1			
1045-1115	Country update: Ethiopia	T. Balemi	30
1115-1145	Country update: Nigeria	I. Mohammad	30
1145-1215	Country update: Tanzania	K. Masuki	30
1215-1230	Discussion		15
1230-1400	Lunch		
Workstream 1.1			
1400-1515	Baseline Yield & Soil survey	P. Craufurd/K. Masuki/ B. Vanlauwe	75
1515-1545	Tea/Coffee Break		
1545-1700	Agronomic Panel Survey	T. Balemi/ J. M. Jibrin/P. Craufurd	75
1700-1715	Close		
Wednesday 14			
Presentation Session 2 Chair – B.D. Tarfa (The Optimizing Fertilizer Recommendations in Africa (OFRA) Nigeria) Rapporteurs – Masuki Kenneth Francis, CIMMYT, Nairobi			
Workstream 1.2			
0830-0900	Recap		
0900-1030	Nutrient Omission Trials & Tools	S. Zingore/J. Rurinda/ T. Balemi/J.M. Jibrin	90
1030-1100	Tea/Coffee Break		
1100-1200	Variety Tool	H. Tonnang/J. M. Jibrin	60
1200-1230	Other use-cases	P. Craufurd	30
1230-1400	Lunch		
Workstream 2.1			
1400-1530	Econometrics & socio-economics: Geospatial econometrics, RoI & Risk	M. Jaleta/ J. Chamberlin	90
1530-1600	Tea/Coffee Break		
1630-1700	Knowledge, Attitudes and Practices study in Tanzania	J. Andersson/ K. Masuki	
1700-1715	Close		
Thursday 15			

Chair – Kola Masha (DOREO-Partners, Lagos) Rapporteurs – Balemi Tesfaye , Country Project Coordinator, CIMMYT-Ethiopia			
Workstream 2.1			
0830-0900	Recap		
0900-1000	Capacity Development & Training needs	J. Andersson/P. Craufurd	60
1000-1030	Tea/Coffee Break		
1030-1200	Data management	H. Tonnang/ J. Adewopo	90
1200-1230	Data sources and initiatives	J. Adewopo	30
1230-1400	Lunch		
Workstream 1.3			
1400-1500	Opportunities for scaling-out with collaborators and new partners (with a focus on Nigeria)	A.Y. Kamara	60
1500-1530	Close of the meeting		
1530- 1600	Tea/Coffee Break and depart		
1630-1800	Core TAMASA Team Meeting: Reporting, Future meetings, AOB	CIMMYT, IITA, IPNI, BUK, EIAR, DRD	

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