TAMASA

Taking Maize Agronomy to Scale in Africa

Year 3 Planning Meeting

2-4 November 2016, Nairobi, Kenya

Compiled by Peter Crawford and Rahel Assefa

Funded By BILL & MELINDA GATES foundation

Partners

Objectives of the Meeting:

- Review and amend work plans for each WS & country for Year 3
- Finalize budget for Year 3 by WS and country
- Develop Project Management (M&E) and Communication Plan for Year 3 & 4
- Finalise data for sharing
- Contribute to web content
- Set date & location next meeting

Outputs from the meetings

- Each country will develop a detailed
  - Work plan
  - Milestones/deliverables
  - Responsibilities
  - Budget
- **Revised Results Framework & Narrative for Year 2 Report**
- Year 1 (and 2) data made accessible

The program is structured round WSs and each will follow the same format (120 mins, with approximate times). The WS leader will:

(i) Propose activities for Year 3 followed by discussion (40 mins)
(ii) Three country teams develop specific workplans, activities and milestones (50 mins)
(iii) Report back and general discussion (30 mins)

Next Meeting:

- Tentative plan for Annual Review Meeting to be held in Uganda from 01-03 March 2017 (once we have more Year 2 data processed)
- Proposal is to have a back-to-back meeting with N2Africa, i.e. shared field day & 2-day meeting with some common participants – Christian Witt must be in attendance

Workshop Agenda

Day 1 – Wednesday November 2nd			
0800 – 0830	Registration	C. Mukundi	
0830 – 0900	Welcome & Meeting Objectives	C. Mukundi	30 min
WS1 0900 – 1000	WS discussion	P. Craufurd	40 min
	Participants will break up into teams per country		20 min
1000 – 1030 Tea/Coffee Break			
WS1 (cont'd) 1030 – 1130	Continue group discussion Summary Report		30 min 30 min
WS2 1130 - 1200	WS discussion	J. Chamberlin	30 min
1200 – 1330 Lunch			
WS2 (cont'd) 1330 - 1500	continue WS discussion		10 min
	Participants will break up into teams per country		50 min
	Summary Report		30 min
1500 – 1530 Tea/Coffee Break			
WS3 1530 -1730	WS discussion	IPNI	40 min
	Participants will break up into teams per country		50 min
	Summary Report		30 min
CLOSE			

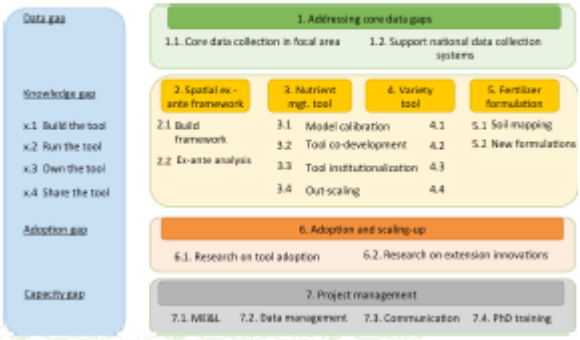
Day 2 – Thursday November 3rd			
WS4 0830 – 1000	WS discussion	H. Tonnang	40 min
	Participants will break up into teams per country		50 min
	Summary Report		30 min
1000 – 1030 Tea/Coffee Break			
WS6 1030 – 1200	WS discussion	J. Chamberlin	40 min
	Participants will break up into teams per country		50 min
1200 – 1330 Lunch			
WS 6 (cont'd) 1330 - 1400	Summary Report		30 min
WS 7 1400 - 1600	WS discussion	R. Assefa	40 min
	Participants will break up into teams per country		50min
	Summary Report		30 min
1600 - 1700 General Discussion			
CLOSE			

Day 3 – Friday November 4th			
0830 – 1000	Data Management	H. Tonnang	90 min
1000 – 1030 Tea/Coffee Break			
1030 - 1100	Data Management		30 min
1100 - 1200	Group discussion - Budget & Website	R. Assefa	60 min
1200 – 1330 Lunch			
1330 - 1430	Group discussion - Budget & Website		30 min
CLOSE			

Work stream 1 & 2

TAMASA workstreams

Note these do not match exactly to Results Framework



Workstream 1

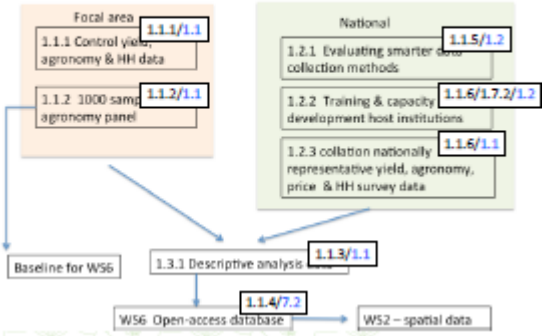
Aim

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

CIMMYT.

WS1 @ March 2016

[RF designation/Revised WS structure]



Year 2 & Year 3 Milestones

	Reduced knowledge gap on spatial & temporal variation in agronomy & productivity	Indicator	Year 1 Target/ Milestone Red text = achieved in Year 1	Year 2 Target/Milestone	Year 3 Target/Milestone
1.1.1	Georeferenced datasets on yield, agronomy and farm household characteristics	No. georeferenced samples added to database; no. geospatial layers generated	500-1000 fields surveyed by Jan in each country; 12 200; KT 500; NG 500	1000 to 3000 control yield data observations collected in KT, NG & TZ	1000 to 3000 control yield data observations collected in KT, NG & TZ
1.1.2	Farm panel data for impact assessment within the ACE	No. georeferenced samples added to database	API for survey developed by Mary; 100 fields in KT and NG surveyed by Jan; CSA instrument developed by June, piloted in KT 100/farm, NG 100 fields	Data collected on 1000 farms in KT, NG & TZ	Data collected on 1000 farms in KT, NG & TZ
1.1.3	Descriptive analysis of data	Reports & papers	N/A	Report summarising Year 1 data	Report summarising Year 2 data, one paper produced
1.1.4	Development of open source database	web-based, accessible database & downloads	Draft protocols written & platform identified	Year 1 data (collected under WS1 to WS6) incorporated into database	Year 2 data (collected under WS1 to WS6) incorporated into database
1.1.5	Evaluation of integration of proximal and remote sensing technologies into yield and agronomy assessments	GPS/ imagery in database. Use of ODK to collect data;	1000 farms developed and used for agronomy, HH and yield data collection in KT, NG and TZ	Closed-looping through mobile phone data-fusion tested in one country; digital soil picture analysis system validated	
1.1.6	Support to national data collection systems	Use of TAMASA & AfSIS SOPs by partners;	1000 in KT supported through training & new tools/equipment to collect GPS yield and soil samples	Agreements with national agency and road-map to support the collection of control yield and soil data in each country	Capacity development of national agencies as per road-map

Activity 1.1.1

	Reduced knowledge gap on spatial & temporal variation in agronomy & productivity	Indicator	Year 1 Target/ Milestone Red text = achieved in Year 1	Year 2 Target/Milestone	Year 3 Target/Milestone
1.1.1	Georeferenced datasets on yield, agronomy and farm household characteristics + grain samples for nutrition analysis	No. georeferenced samples added to database; no. geospatial layers generated	500-1000 fields surveyed by Jan in each country; 12 200; KT 500; NG 500	1000 to 3000 control yield data observations collected in KT, NG & TZ	1000 to 3000 control yield data observations collected in KT, NG & TZ

- Year 2 target?: 1000-3000
  - ET: APS 400; CSA 400; other?
  - NG: APS 750; other?
  - TZ: APS 750; other?
- Year 3 target?: 1000-3000
  - ET:
  - NG:
  - TZ:

Largely from APS. Any issues?

- How to increase control /farmer yield observations?

CIMMYT.

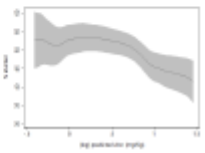
Grain nutrition samples

- Geo-nutrition…Rothamsted initiative through AfSIS
- Spatial grain and soil samples for Se and Zn
- What grain samples do we have available?

2016

- ~ 300g fwt (air dried) grain at harvest
- AfSIS ODK 'Maize sample' form
- QR code samples

Stunting rates and soil zinc content, for wheat farming households in ET



Increasing control/farmer yield data

- Control or farmer practice data from other on-farm experiments within CIMMYT/IITA
- Develop and ODK-lite version of yield, soil & min. HH data for partners
- Promote & train partners to do this (subject to interest)
- Provide mobiles to some partners?
- Any other suggestions?

CIMMYT.

Activity 1.1.2

	Reduced knowledge gap on spatial & temporal variation in agronomy & productivity	Indicator	Year 1 Target/ Milestone Red text= achieved in Year 1	Year 2 Target/Milestone	Year 3 Target/Milestone
1.1.2	Farm panel data for impact assessment within the ACI	No. georeferenced samples added to database	API for survey developed by May; 100 fields in ET and NG surveyed by Jan; ODK instrument developed by June; piloted in ET 100 fields, NG 180 fields	Data collected on 1000 farms in ET, NG & TZ	Data collected on 1000 farms in ET, NG & TZ

- Year 2 target?: 1000
  - ET: APS 400
  - NG: APS 750
  - TZ: APS 700
- Year 3 target?: 1000
  - ET: APS 750
  - NG: APS 750
  - TZ: APS 700
- Other opportunities?

What did this actually cost in each country?

What are the implications for Year 3 and Year 4?

CIMMYT.

Activity 1.1.3

	Reduced knowledge gap on spatial & temporal variation in agronomy & productivity	Indicator	Year 1 Target/ Milestone Red text= achieved in Year 1	Year 2 Target/Milestone	Year 3 Target/Milestone
1.1.3	Descriptive analysis of data	Reports & papers	NA	Report summarising Year 1 data	Report summarising Year 2 data; one paper produced

- Year 2 target:
  - Report/summary of data collected in Year 1
- Year 3 target:
  - Report/summary of data collected in Year 2
  - One journal article
- Who is going to make the summary?
  - Peter & Jordan?

CIMMYT.

Activity 1.1.4 (7.2 Data Mgt)

	Reduced knowledge gap on spatial & temporal variation in agronomy & productivity	Indicator	Year 1 Target/ Milestone Red text= achieved in Year 1	Year 2 Target/Milestone	Year 3 Target/Milestone
1.1.4	Development of open access database	web-based, accessible database & downloads	Draft protocols written & platform identified	Year 1 data (collected under WP1 to WP4) incorporated into database	Year 2 data (collected under WP1 to WP4) incorporated into database

- To be discussed Friday AM
- Note C.Witt wants more harmonized system across TAMASA, ACAI, Banana, N2Africa & CSISA

CIMMYT.

Activity 1.1.5

	Reduced knowledge gap on spatial & temporal variation in agronomy & productivity	Indicator	Year 1 Target/ Milestone Red text= achieved in Year 1	Year 2 Target/Milestone	Year 3 Target/Milestone
1.1.5	Evaluation of integration of proximal and remote sensing technologies into yield and agronomy assessments	UAV imagery in database; Use of ODK to collect data;	ODK forms developed and used for agronomy, HH and yield data collection in ET, NG and TZ	Crowd-sourcing through mobile-phone distribution tested in one country; digital ear picture analysis system validated	

- Year 2 target? Planned for ET
  - Mobile-phone crowd-sourcing; discussed but not implemented
  - Digital ear photographs; discussed with QED & planned for VT trials in ET
- Year 3
  - Other suggestions for crowd-sourcing?

Current ET unrest

Postpone to Year 3?

Add UAV milestones Year 2 (NG)

UAV milestones Year 3 (ET, NG & TZ)?

CIMMYT.

Activity 1.1.6

	Reduced knowledge gap on spatial & temporal variation in agronomy & productivity	Indicator	Year 1 Target/ Milestone Red text= achieved in Year 1	Year 2 Target/Milestone	Year 3 Target/Milestone
1.1.6	Support to national data collection systems	Use of TAMASA/E ASSS SOPs by partners;	CSA in ET supported through training & low-cost equipment to collect 500 yield and soil samples	Agreements with national agency and road-map to support the collection of control yield and soil data in each country	Capacity development of national agencies as per road-map

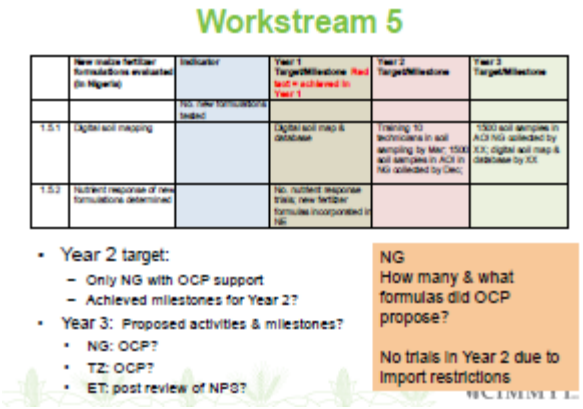
- Year 2
  - ET: agreement with CSA for 2016 harvest
  - No roadmap in ET, NG, TZ
- Year 3
  - Develop longer-term plan with CSA
  - Develop activity with identified institutions in NG & TZ

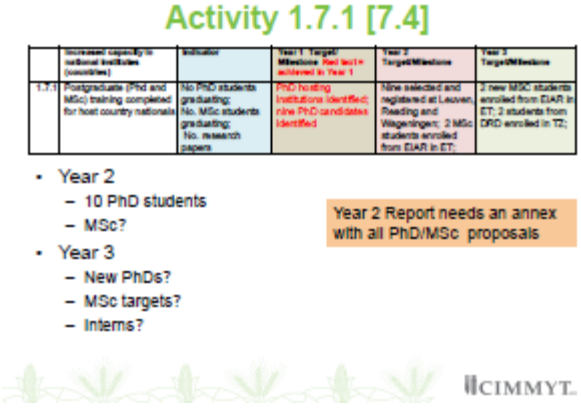
1.7.2 Technical training given & planned for APS & control yield

TZ – Food Security Bureau of MAFL (building on/with Maryland)?

NG – is NEARLS the right institution?

CIMMYT.





Group reports

Nigeria

	Reduced knowledge gap on spatial & temporal variation in agronomy & productivity	Indicator	Year 3 Target/Milestone
1.1.1	Georeferenced datasets on yield, agronomy and farm household characteristics	No. georeferenced samples added to database; no. geospatial layers generated	1250: 750 by TAMASA Team + 500 by partners (using the light version)
1.1.2	Farm panel data for impact assessment within the AOI	No. georeferenced samples added to database	1250: 750 by TAMASA Team + 500 by partners (NDVI, Plant Height, Weed Cover, Geo-nutrition samples); Utilize UAV for data collection at selected locations where there is overlap of APS and calibration trial.
1.1.3	Descriptive analysis of data	Reports & papers	Report summarizing year 2; 2 papers published by July
1.1.4	Development of open access database	web-based, accessible database & downloads	Protocol co-developed and adopted for data management by end of January
1.1.5	Evaluation of integration of proximal and remote sensing technologies into yield and agronomy assessments	UAV imagery in database; Use of ODK to collect data;	Preliminary results from first year UAV missions relative to NOTs data presented by March 2017
1.1.6	Support to national data collection systems	Use of TAMASA & AfSIS SOPs by partners;	Contacts made with key partners with interest in Crop yield data collection (FAO, CBN, NAERLS, FEWSNET, Sasakawa, NBS, FEWSNet, Bank of Agric); Convene a 1-day interaction meeting with these key partners with key focus on facilitating a paradigm shift in data collection (invite partners as co-organizers and NAERLS to host)

Ethiopia

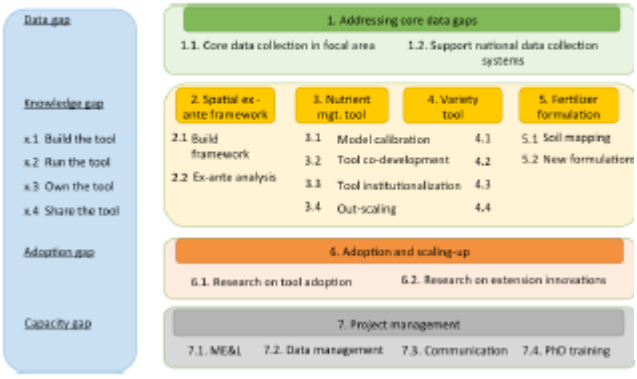
		Evidence of the use of spatial data and methods by research, statistical and development organizations		Indicator	**Year 3**
1		Reduced knowledge gap on spatial and temporal variation in agrononomy and productivity	WS1		Target/Milestone
	1.1.1	Georeferenced datasets on yield, agronomy and farm household characteristics		No. georeferenced samples added to database; no. geospatial layers generated	1000 to 1200 control yield data observations collected in ET
	1.1.2	Farm panel data for impact assessment within the AOI		No. georeferenced samples added to database	672 APS
	1.1.3	Descriptive analysis of data		Reports & papers	Report summarising Year 2 data
	1.1.4	Development of open access database		web-based, accessable database & downloads	Year 1 and 2 data (collected under WS1 to WS4) incorporated into database
	1.1.5	Evaluation of integration of proximal and remote sensing technologies into yield and agronomy assessments		UAV imagery in database; Use of ODK to collect data;	1.Finalize import process before cropping season (April 2017) 2. Conduct training for 5 people 3. Convene a small meeting with potential users (other than CIMMYT)
	1.1.6	Support to national data collection systems		Use of TAMASA & AfSIS SOPs by partners;	Capacity development of national agencies such as Regional Research institute and CSA - Set up a meeting with Digital green and their national partners (ATA and Ministry of Agriculture) - Evaluate their system (coco - collect online collect offline) so we can contribute or leverage as cost effective data collection, monitoring and evaluation tool

Tanzania

		Evidence of the use of spatial data and methods by research, statistical and development organizations	Indicator	
1.1		Reduced knowledge gap on spatial and temporal variation in agrononomy and productivity		Target/Milestone for year 3
	1.1.1	Georeferenced datasets on yield, agronomy and farm household characteristics	No. georeferenced samples added to database; no. geospatial layers generated	610+ control yield data observations collected in TZ end of season + geo-nutrition by October 2017
	1.1.2	Farm panel data for impact assessment within the AOI	No. georeferenced samples added to database	Data collected on 610+ HHS in TZ mid season + green seeker by July 2017
	1.1.3	Descriptive analysis of data	Reports & papers	Report summarising Year 2 data
	1.1.4	Development of open access database	web-based, accessable database & downloads	Year 2 data (collected under WS1 to WS4) incorporated into TAMASA database by July 2017
	1.1.5	Evaluation of integration of proximal and remote sensing technologies into yield and agronomy assessments	UAV imagery in database; Use of ODK to collect data;	At least 10 UAV flight missions done in NOTs and PhD student's trial sites by July 2016
	1.1.6	Support to national data collection systems	Use of TAMASA & AfSIS SOPs by partners;	Identify at least 4 national level operation partners (FSD/Maryland, NBS, DRD, Policy & Planning Dept) to establish purpose means and challenges bu October 2017

APS - Agronomic Panel Survey

TAMASA workstreams



Purpose of the APS

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

Sampling farm households

- Within 10km² grids, we randomly select farm households for inclusion in the APS sample
- ~600-800 households per country
  - Tanzania: 30 households in 26 grids = ~~780~~ 680 households
  - Ethiopia: 50 households in 12 grids = 600 HHs (380
  - Nigeria: 99 villages / 780 households
- Sampling strategy varies by country:
  - Tanzania: quick listings within 1km² sub-grids used by AfSIS
  - Ethiopia: spatial sampling protocol at random points
  - Nigeria: listing at village level

APS components

- Household questionnaire
- Plot questionnaire (focus plot)
- Soil sampling (focus plot)
- Crop cuts (focus plot)
- Community questionnaire
- Complementary data from UAV sensors (TZ, NG)
- Additional in-situ data collection? Green seeker…

Agronomic panel survey timing

- 2016
  - Harvest period only
  - Questionnaires, crop cuts, soil samples
- 2017
  - Pre-planting, mid-season, harvest
  - Questionnaires (divided), crop cuts (harvest), (soil samples?)
- 2018
  - Pre-planting, mid-season, harvest
  - Questionnaires (divided), crop cuts (harvest), (soil samples?)

APS panel definition

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

Questionnaire components

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

Where we are & next steps

- Data collection (ET) and cleaning (TZ, NG)
  - Automated processing routines
  - Protocols for min. cleanliness
- Generate initial descriptive statistics
  - Will work with students in each country
  - What products to aim at?
- Figure out what to do next season…

Questions

- APS for ex post impact assessment
  - When rolling out tools for testing? How to use APS as baseline; randomization strategy…
- What data to collect when?
  - Mid-season visits starting this year?
  - Green seeker? Geo-nutrition?
- Institutionalization
  - What partners? What support do they need? Roadmap…
- Augmenting APS data
  - Expansion via light version
  - Pilot farmer self-reporting via smart phone…

APS – Workstream 2

Questions

- APS for ex post impact assessment
  - When rolling out tools for testing? How to use APS as baseline; randomization strategy…
- What data to collect when?
  - Mid-season visits starting this year?
  - Green seeker? Geo-nutrition?
- Institutionalization
  - What partners? What support do they need? Roadmap…
- Augmenting APS data
  - Expansion via light version
  - Pilot farmer self-reporting via smart phone…

Answers

- What data to collect when?
  - Mid-season visits starting this year?
  - Green seeker? Geo-nutrition?

- We will maintain the same components of the questionnaire but this will be split into mid-season and harvest survey (expected budget = $35,000) to cover 1,250 HH
- Greenseeker for NDVI, Plant Height, Weed Cover, Collect samples and tag for geo-nutrition analysis
- Use UAV to collect data at selected overlapping locations for APS and Calibration trials (also covering Farmers' fields)

- Institutionalization
  - What partners? What support do they need? Roadmap…
  - Identified partners : NAERLS, NBS, Sasakawa, CBN, FAO, Doreo Partners, FEWSNet, Bank of Agric
  - Engage partners for initial scanning of capacity needs
  - Support NAERLS to host 1-day meeting focused on paradigm shift in crop yield data collection (partners invited as co-organizers)

- Augmenting APS data
  - Expansion via light version
  - Pilot farmer self-reporting via smart phone…
- Provide inputs on Jordan's initial version of "APS-Light"
- Pilot self-reporting…How?? Jordan provide framework , and contact GES/FMARD

Work stream 3

Use Case III: Site-specific Nutrient Management (SSNM)

SSNM Use Case Objectives and Outputs

- Co-develop demand-driven, rapid and cost-effective methods and tools for providing farmers with site-specific fertilizer recommendations that will increase yield and profit of farmers; demand creation with service providers.

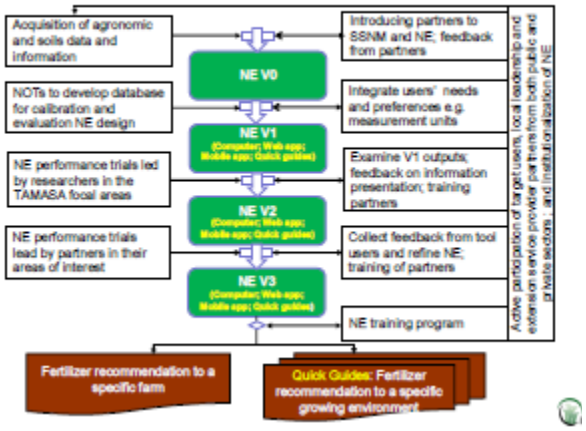
Primary clients
- Extension services provider partners
  - Public extension systems
  - Developmental organizations
  - Private sectors (e.g. fertilizer industry)

Use Case Objectives & Outputs

- Nutrient Expert (and associated tools) for maize decision support tool for use by extension systems to develop and promote farm-specific nutrient management recommendation.
- Nutrient Expert extension formats for use by partners in taking site-specific fertilizer recommendations to scale.

Use Case Outputs: Nutrient Expert

NE co-development process



Use Case III: major outputs (YR 1-2)

Activity		Major Output
Nutrient omission and performance trials protocols	Develop guidelines and protocols for the implementation of on-farm maize nutrient omission & performance trials	Std protocols developed
Nutrient omission trials	Establishment of multi-location nutrient omission trials in ET, NG & TZ	•Agronomic database develop •NE V1 developed (computer) ✓Computer version (ET, NG, T ✓Web app (ET & NG) ✓Mobile app (ET & NG)
NE performance trials	Establishment of multi-location NE performance trials in ET, NG, TZ	• Harvesting is in progress in E and NG •Trials about to be established TZ
Partner engagement	•Identification and engagement of primary service provider partners (tool users and tool hosts) for co-developing NE •Train partners on principles of SSNM and use of NE decision support tool	•Primary NE users and hosts identified in ET, NG & TZ • Extension trained on the use NE. However empowerment o extension on the use of NE wi be the main focus of Yrs 3 & 4

Nutrient Omission Trials

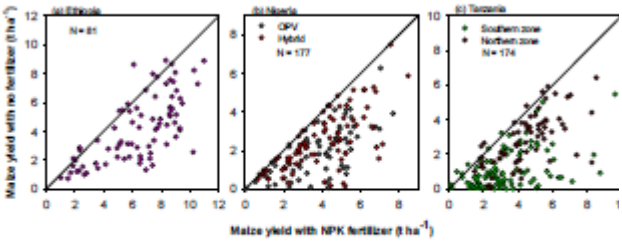
Objectives of NOTs

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

NOTs established

Country	Number of NOTs established in TAMASA focal areas			
	Season			
	2015		2016	
	Hybrid	OPV	Hybrid	OPV
Ethiopia	81	-	70	-
Nigeria	88	89	100	100
Tanzania	-	-	174	-

NOTs



- Maize yield increased drastically when NPK fertilizer was applied in many TAMASA study sites in all three countries
- This suggests that nutrient management and improved fertilizer recommendations is a major entry point for increased maize productivity and profitability of small holder maize farmers

NOTs

Table 1: Cluster analysis results of maize yield response to different nutrients in Tanzania

Cluster	Major determinant	No. of sites in SZ	No. of sites in NZ
1	High response to N	16	19
2	High response to N & P	25	8
3	High response to N, P & K	11	7
4	High response to micronutrients	10	8
5	Low response to N, P, K and micronutrients	25	21
6	High response to P	12	1
7	High response to N, P, K & micronutrients	8	-
Total N		107	64

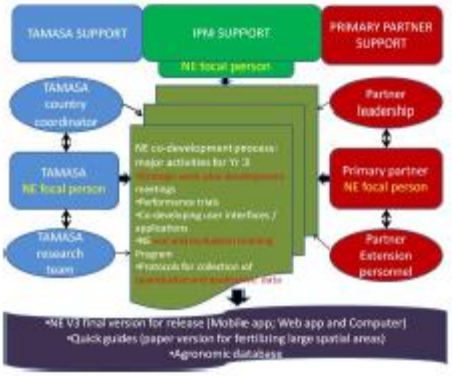
- Maize response to different nutrients varies with geographic location
- This confirms that SSNM is important for improved maize yields in many areas in Ethiopia, Nigeria and Tanzania

Engaging partners on the use of NE

Engagement of partners for co-development of NE

Country	NE host institution	NE user institution
Ethiopia	EIAR (Land, Water Resource Research directorate) / ATA	• MOANR (Department of soils and extension) • SG 2000 • GIZ
Nigeria	BUK	• SG 2000 • DOREO Partners • NOTORE • ADP
Tanzania	ARI Mlingano	One Acre Fund Uyole Selian Agricultural Research Institute (SARI)

Use Case 3: Partner engagement plan for Yr 3



Performance trials in Tanzania in 2016-17

- In TZ: PTs will be primarily lead by TAMASA research team
  - ✓ About 100 trials will be conducted (40 in NZ and 60 in SZ)
  - ✓ The number and site of PTs are decided based on cluster analysis of maize yield response
- Four fertilizer recommendations
  1. Control (zero fertilization)
  2. NE V1 fertilizer recommendations
  3. Regional fertilizer recommendations
  4. Soil based recommendations

NE performance trials in ET & NG in 2017

- In ET & NG - PTs will be primarily lead by partners
  - ✓ ET – MOANR; SG 2000; GIZ
  - ✓ Nigeria: SG 2000; DEREO Partners; NOTORE
- Two fertilizer recommendation treatments:
  1. Partner's fertilizer recommendation
  2. Fertilizer recommendations developed from NE V2

Questions

- How can we engage our partners better for the co-development and use of NE at scale?
- How can we improve the collection of input data for running NE?

Group reports

Nigeria

	Nutrient management tool available		Year 3
		Indicator	out put
1.3.1	NE co-development (tool design evaluation; sensitivity analysis)	Important variables and modules for runing NE further defined	NE V2 for ET and NG simplified
1.3.2	Validation of NE predictions - step I	No. of NE performance trials established by TAMASA research team in TZ	Database of NE performance trials developed for TZ ; NE v2 developed for TZ
1.3.3	Validation of NE predictions - step II	No. of evaluation trials established by TAMASA' s primary partners in ET & NG	SOPs for NE evaluation developed; Database of NE evalaution trials for ET &NG developed; NE v3 developed and released for use in ET & NG
1.3.4	Improving protocols for collecting NE input data	Important input data required to run NE documented	Improved protocols developed
1.3.5	Co-development of NE interfaces/applications	Workshops reports describing tool users' specific needs and demands	Different user defined interfaces designed (PC; mobile app, paper, etc)
1.3.6	Training extenison service providers and receiving feedback on NE	Training workshops reports; no. of extension trained; Feedback on the use of NE V2 and interfaces	At leat 50 extension pessonal in each country be able to run NE tool to produce reliable fertilizer recommendations; Yield and profit increased as a result of NE V2 recommendations
1.3.7	Institutionalizing of NE tool	Meetings with potential NE host institutions; Signing of MOU; No. of support staff trained	Reports; MOU; A roadmap for capacity development and scaling up the use of NE developed

Ethiopia

				Year 3
1.3		Nutrient management tool available	Tool versions	
	1.3.1	Tool co-development V0= desktop software; v1 calibrated for each country; v2=validated V1; V3 user versions		Engage selected users from EIAR, SG2000 and the Ministry of Agriculture to get an understanding on how they will be using the tool Select 3 different user sets with differing needs to do testing on the tool
	1.3.2	Validation of prediction		Use data from PT to do an analysis of productivity and profitability analysis resulting in a publishable paper
	1.3.3	Evaluate tool design		Collect feedback from identified users

	1.3.4	Institutionalising tool		Providing the tool in various formats (paper, PC, mobile) to be used by the identified institutions
	1.3.5	Outscaling tool use	No. users accessing and using tool; No. farmers benefitting from tool	A training event held in identified institutions

Tanzania

				Year 3
1.3		Nutrient management tool available	Tool versions	
	1.3.1	Tool co-development V0= desktop software; v1 calibrated for each country; v2=validated V1; V3 user versions		Stakeholder & user meeting held in Arusha, TZ by Mar; tool design(s) specified by May 2017;
	1.3.2	Validation of prediction		Validation of QUEFTS model in TZ
	1.3.3	Evaluate tool design		Validation of tool v0 in TZ
	1.3.4	Institutionalising tool		Strategy & capacity needs-assessment for TZ by Apr 2016
	1.3.5	Outscaling tool use	No. users accessing and using tool; No. farmers benefitting from tool	Identify at least 4 potential users (Village/Ward extension workers, NGOs/VBAs, Input suppliers, Progressive farmers, Researchers) to assess user needs by October 2017

Work stream 4

Site specific Nutrient Management (SSNM) Use Case

Site specific Nutrient Management (SSNM) Use Case (TAMASA project) – Nutrient Omission trials (NOTs) established in Tanzania in 2016

1. Objectives of NOTs

i. To gain understanding of the local maize production systems and the influence of farm socio-economic and soil fertility variability, and historical and current management practices on maize yields.

ii. To develop maize yield, yield response and nutrient uptake datasets for calibration of NE algorithms to develop SSNM practices under variable soil fertility and climatic conditions in TAMASA project pilot sites.

2. Preliminary results

- Overall nitrogen is the most limiting nutrient for maize production in many geographic locations in Tanzania (Fig. 1.)
- P is the second most limiting nutrient for maize production (Fig. 1).

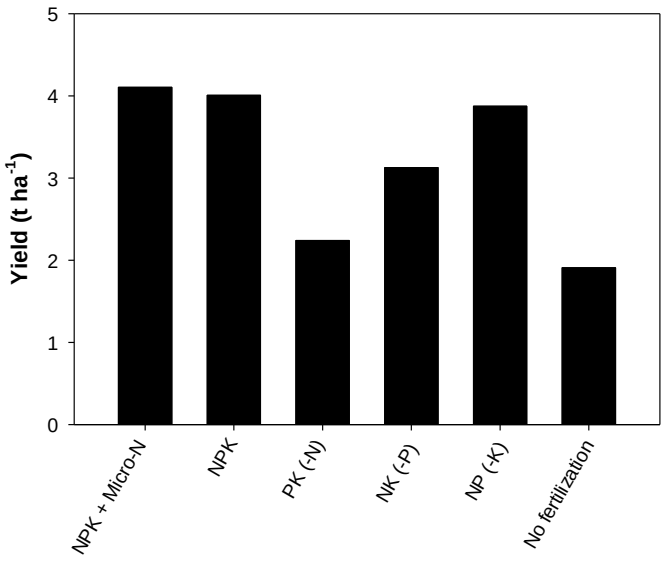


Fig. 1: Maize yield observed from Nutrient Omission trials (N = 174) established in 2016 in southern and northern zones of Tanzania.

Key messages

- Attainable maize grain yield varied with geographic location. For example in Songea rural, the observed attainable yield was as high as 9 t ha $^{-1}$ whilst in Mbeya the attainable yield was as low as 2 t ha^{-1} (Fig. 2)
- Nitrogen and phosphorus are the nutrients most limiting maize production in all the districts studied in southern zone of Tanzania (Fig. 2)

- The impacts of K and micro-nutrients on maize yield were small (Fig. 2).

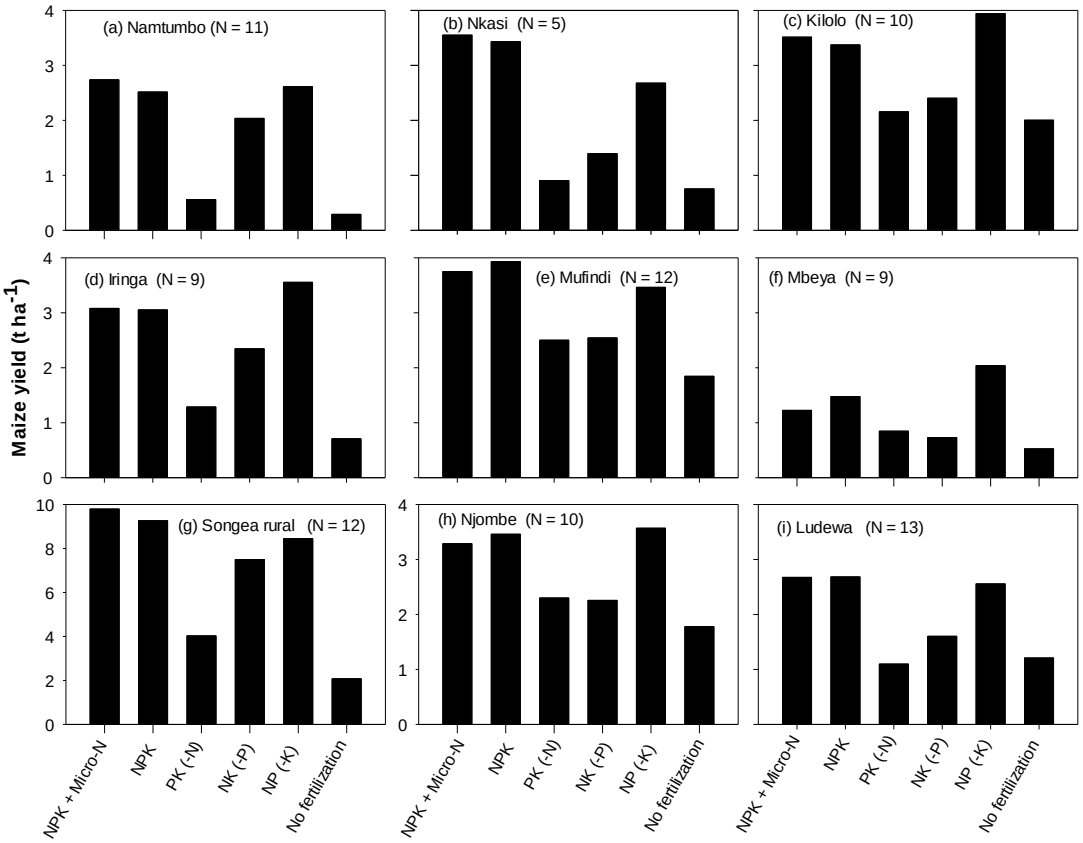


Fig. 2A: Maize yield observed from nutrient omission trials (NOTs) established in different districts in southern zone of Tanzania.

Key messages

- Nitrogen is the nutrient most limiting maize yield in northern zone of Tanzania.
- The impacts of P, K and micro-nutrients are small in the northern zone of Tanzania.

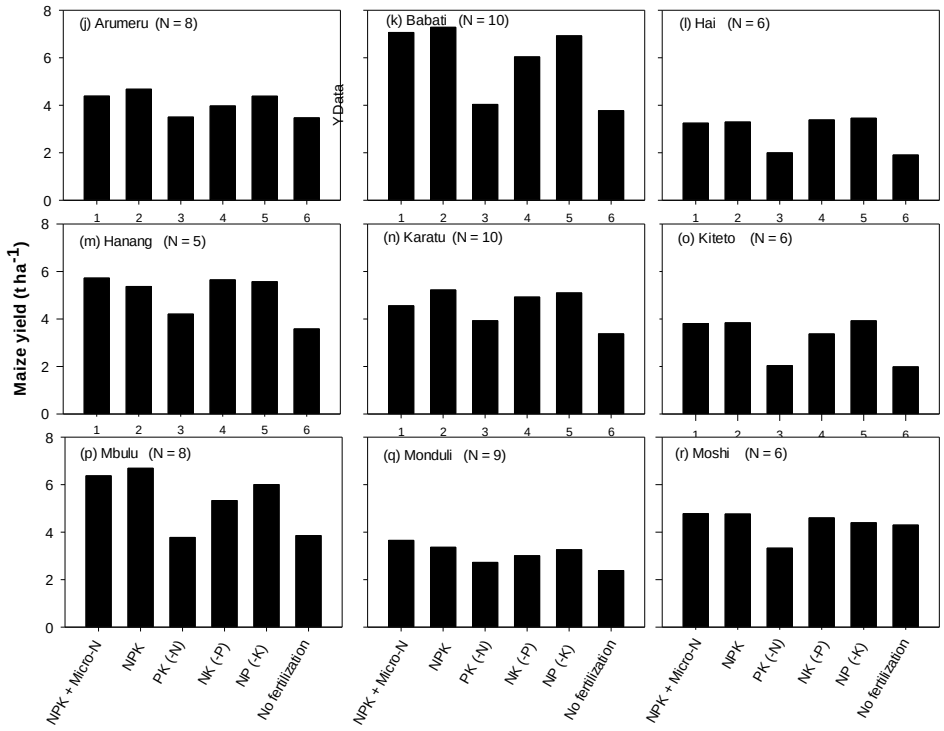


Fig. 2B: Maize yield observed from Nutrient Omission Trials (NOTs) established in different districts in northern zone of TFig. 2B: Maize yield observed from Nutrient Omission Trials (NOTs) established in different districts in northern zone of Tanzania.

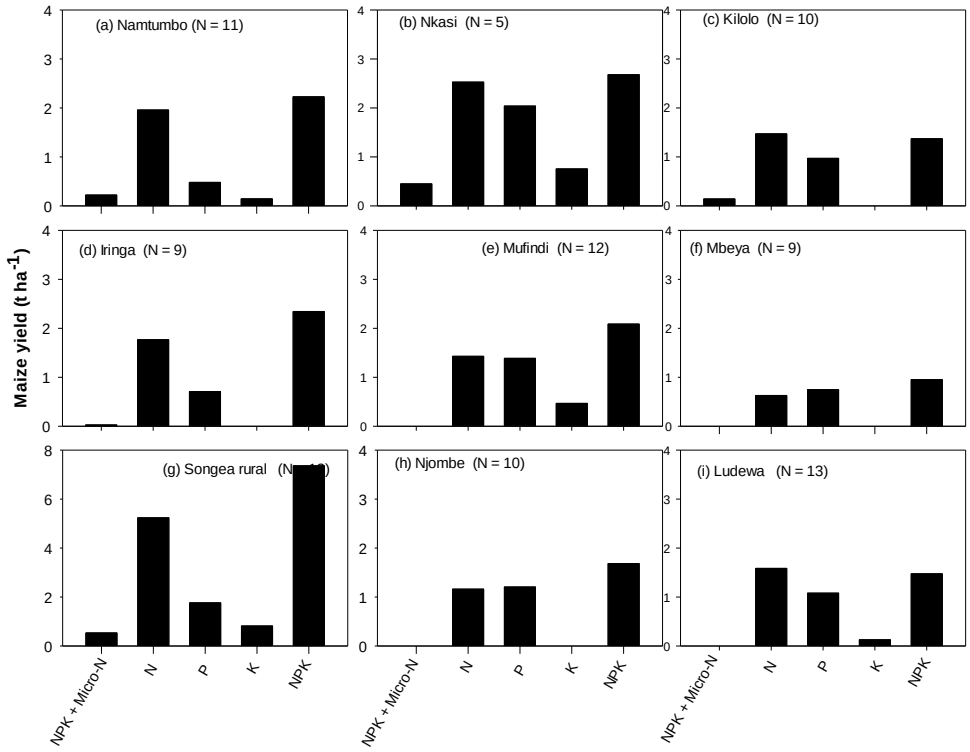


Figure Fig. 3A: Yield response to different nutrients across districts in southern zone of Tanzania.

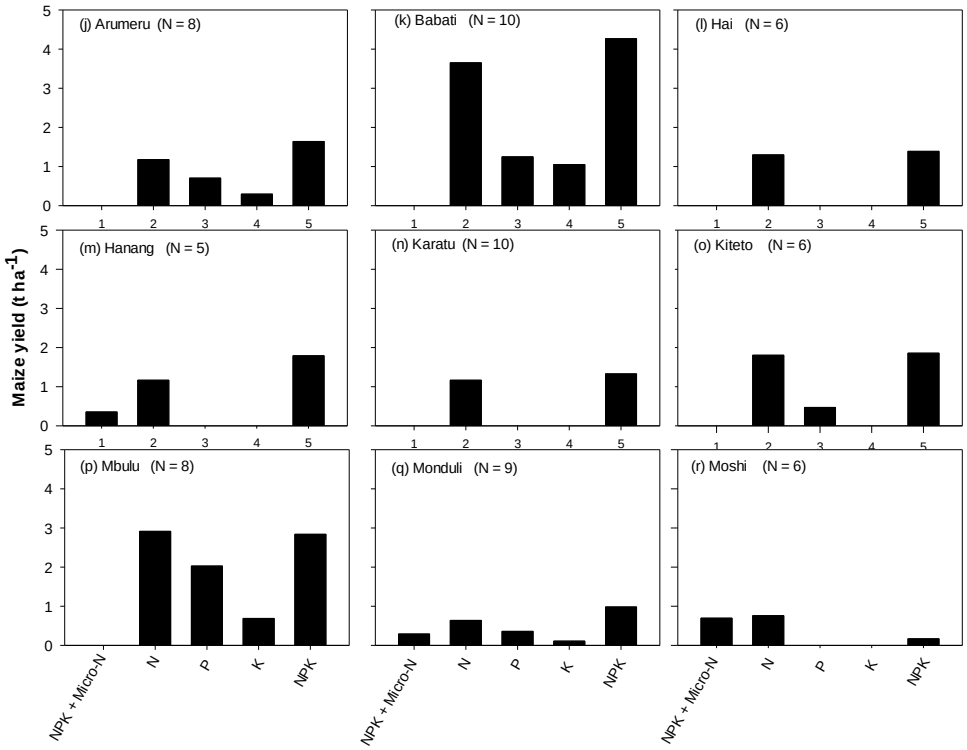


Fig 3B: Maize yield response to different nutrients across districts in northern zone of Tanzania.

Key messages

- Maize yield responded to fertilization across all districts studied in southern and northern zones of Tanzania although the yield response was more pronounced in the southern zone (Fig. 4).

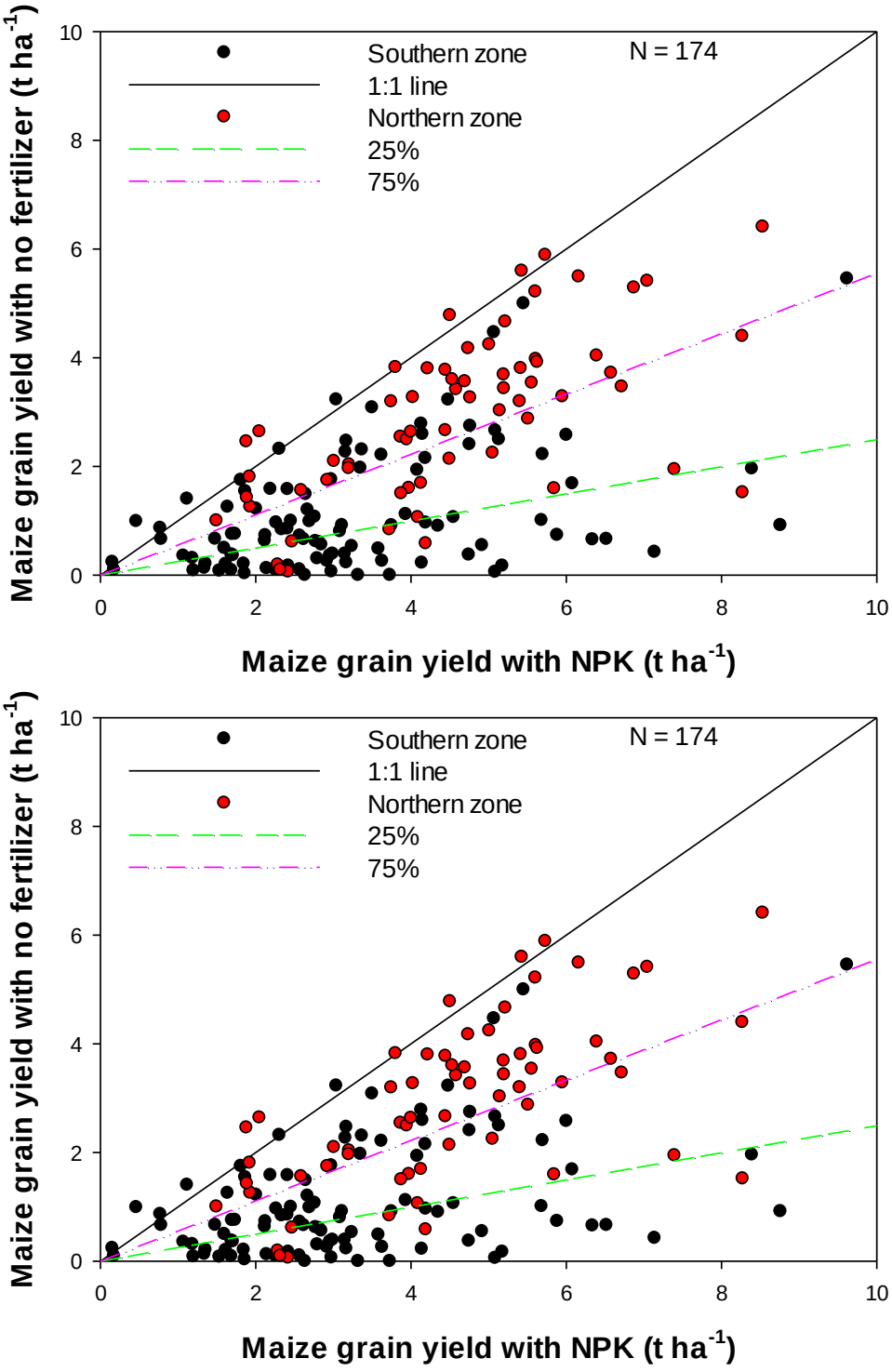


Fig. 4: The relation between yield from control (no fertilizer applied) and yield with NPK.

Use Case III: SSNM

Operational framework for one-on-one engagement with each TAMASA primary partner in each of the three countries for the co-development of NE

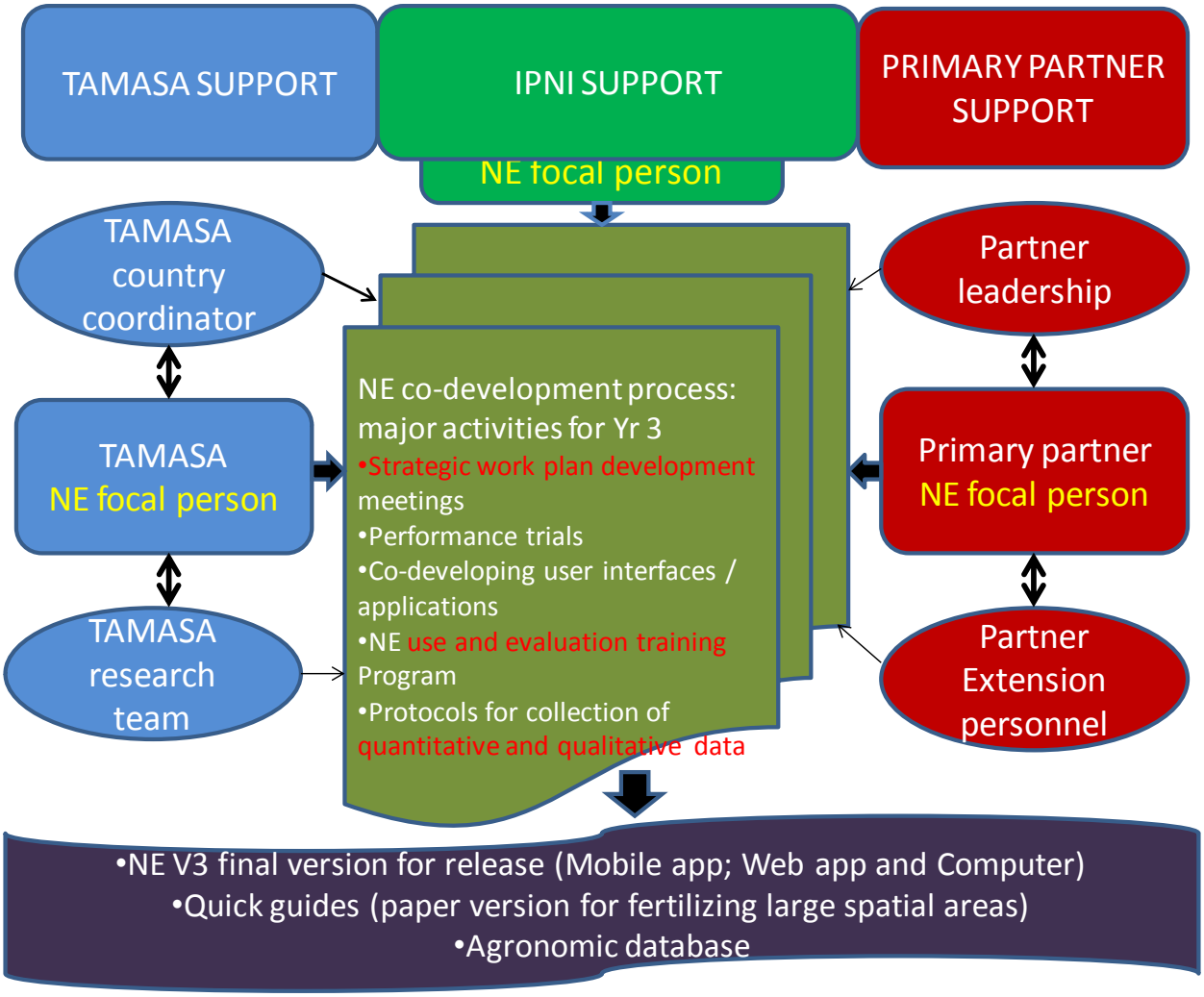


Fig. 1, Operational framework for engaging TAMASA primary partners for the co-development of NE in Ethiopia, Nigeria and Tanzania.

Group reports

Tanzania

1.4		Variety options tool available	Indicator	Year 3
	1.4.1	Tool co-development (The model; PCV = desktop software; ApV=API	Functional model	Core algorithm components coded;ApV produced for TZ by June 2017
	1.4.2	Validation of prediction	No. calibration expts	
	1.4.3	Evaluate tool design	Meeting report and functional ApV	Stakeholder meeting with potential tool users by April; ApV interface and design assessed by one user in FA in TZ by December 2017
	1.4.4	Institutionalizing tool	Hosting agreement	Hosting & capacity development agreements signed in each country; capacity development & mentoring host institution staff by November 2017
	1.4.5	Outscaling tool use	No. training & awareness events; no tool users	Awareness and promotion strategy and materials for tools developed for each country; field days and one stakeholder meeting held to raise awareness of tool by November 2017.

Nigeria

1.4		Variety options tool available	Indicator	Year 3
	1.4.1	Tool co-development (The model; PCV = desktop software; ApV=API	Functional model	Variety selection tool produced for NG
	1.4.2	Validation of prediction	No. calibration expts	Validation of V1 of variety selection tool in NG.
	1.4.3	Evaluate tool design	Meeting report and functional ApV	Variety selection tool and related user interfaces hosted by a local institution (IAR, Zaria)
	1.4.4	Institutionalizing tool	Hosting agreement	Use of variety selection tool by primary partners (e.g. SG 2000; DEREO partners; NOTORE; ADP) in NG
	1.4.5	Outscaling tool use	No. training & awareness events; no tool users	Awareness and promotion strategy and materials for tools developed for each country; field days and one stakeholder meeting held to raise awareness of tool.

Ethiopia

1.4		Variety options tool available	Indicator	Year 3
	1.4.1	Tool co-development (The model; PCV = desktop software; ApV=API	Functional model	Meeting organized onVT issue with relevant partners (Jan., 2017)) e.g MoANR crop directorate, EIAR-crop, regional BoA-crop, District BoA-crop, Zonal BoA-crop, Seed enterprises
	1.4.2	Validation of prediction	No. calibration expts	Validation of the tool by secondary partners/user organizations at different places
	1.4.3	Evaluate tool design	Meeting report and functional ApV	Field days organized to evaluate the VT prediction
	1.4.4	Institutionalizing tool	Hosting agreement	MoU signed between CIMMYT and EIAR
	1.4.5	Outscaling tool use	No. training & awareness events; no tool users	Awareness and promotion strategy and materials for tools developed for each country; field days and one stakeholder meeting held to raise awareness of tool; partners trained on the use of the tool;

Work stream 7

Workstream 7 - Project Management

- Postgraduate (Phd and MSc) training completed for host country nationals
- Technical training of research and extension staff in the use and application of TAMASA tools and SOPs
- Timely reporting
- Annual planning & progress meetings
- Annual ME&L report
- Effective communication

Year 2 & Year 3 Milestones

			Indicactor	Year 1 Target/ Milestone	Year 1 Actual	Year 2 Target/ Milestone	Year 3 Target/ Milestone
1.7		Increased capacity in national institutes (countries)	Recruitment of qualified staff				
	1.7.1	Postgraduate (Phd and MSc) training completed for host country nationals	Degree certificates; papers published	PhD hosting institutions identified; nine PhD candidates identified	Nine selected and registered at Leuven, Reading and Wageningen; 2 MSc students enrolled from EIAR in ET;	2 new MSC students enrolled from EIAR in ET; 2 students from DRD enrolled in TZ;	2 new MSC students enrolled from EIAR in ET; 2 students from DRD enrolled in TZ; **New PHDs? Interns?**
	1.7.2	Technical training of research and extension staff in the use and application of TAMASA tools and SOPs	Surveys	NA	Training in GPS, ODK and SOPs given in TZ in Jul, NG in Aug; ET in Aug	On-demand training from core and new partners in GIS, ODK and SOPs in each country	On-demand training from core and new partners in GIS, ODK and SOPs in each country

Year 2 & Year 3 Milestones

			Indicator	Year 1 Target/ Milestone	Year 1 Actual	Year 2 Target/ Milestone	Year 3 Target/ Milestone
1.8		Project management					
	1.8.1	Timely reporting	On-time submission	Six month inception report by May; Annual report by November	Achieved	Revisions to Narrative and RF by Feb; Annual Reports by November	Annual Reports by November
	1.8.2	Annual Planning meetings	Updated RF/RT	Inception meeting in Addis in Feb; core group meeting in Nairobi in April; Annual meeting in Abuja in Oct	Achieved ; core group meeting in Nairobi in November	Annual meeting in Arusha in Mar	Annual meeting in Uganda
	1.8.3	Annual ME&L Report	Progress surveys			Design progress surveys and system; ME&L Report for Year 1	Conduct progress surveys; ME&L Report for Year 2; external review report
	1.8.4	Effective communication	No. knowledge products; no. awareness events			Communication strategy developed by May;TAMASA web site by Sept	Six WS-based knowledge sharing products; awareness campaigns reach six stakeholders & users in AOI in each country Launch of website

Action Plan – Year 3

- Monthly Meeting
  - Status updates with roles and responsibilities
  - Financial updates
- Technical training of research and extension staff
  - Identify research and extension staff to be trained
- Timely reporting
  - Changes to the results framework
  - Revision to narrative
- Annual planning & progress meetings
  - Materials to be prepared prior to the meeting (especially since Christian Witt will be in attendance)
  - Website content
- Annual ME&L report
  - ME&L – how do we make it part of the science?
- Effective communication
  - Awareness campaign
  - Website content

Group reports

Ethiopia – WS1

		Year 3	M&E		
		Target/Milestone	Mesasurable Output	Progress Indicator	Frequency
	Evidence of the use of spatial data and methods by research, statistical and development organizations	ET:1000 to 1200 control yield data observations collected (600 by CSA and 600 by EIAR)	Collected data put into a database	No of yield and HH data collected	At the end of the season
	Reduced knowledge gap on spatial and temporal variation in agrononomy and productivity	This activity was merged with 1.1.1 as of Year 2	Collected data put into a d	No of yield and HH data collected	At the end of the season
1.1.1	Georeferenced datasets on yield, agronomy and farm household characteristics	Report summarising Year 2 data	Report on APSReport yield	Draft tables/figures	Once a month
1.1.2	Farm panel data for impact assessment within the AOI	Year 1 and 2 data (collected under WS1 to WS4) incorporated into database	Data is in the database	No. of cleaned variables	Once a month
1.1.3	Descriptive analysis of data	1.Finalize import process before cropping season (April 2017) 2. Conduct training for 5 people 3. Convene a small meeting with potential users (other than CIMMYT)	Summary Report	Identify 5 trainees/trainers and potential users	Weekly
1.1.4	Development of open access database	Capacity development of national agencies such as Regional Research institutes and CSA - Set up a meeting with Digital green and other national partners (ATA and Ministry of Agriculture) - Evaluate their system (coco- collect online collect offline) so we can contribute or leverage as cost effective data collection, monitoring and evaluation tool	Number of trained partner	Partners identified and approached by end of January 2017	Monthly
1.1.5	Evaluation of integration of proximal and remote sensing technologies into yield and agronomy assessments	1.Finalize import process before cropping season (April 2017) 2. Conduct training for 5 people 3. Convene a small meeting with potential users (other than CIMMYT)	Summary Report	Identify 5 trainees/trainers and potential users	Weekly
1.1.6	Support to national data collection systems	Capacity development of national agencies such as Regional Research institute and CSA - Set up a meeting with Digital green and their national partners (ATA and Ministry of Agriculture) - Evaluate their system (coco - collect online collect offline) so we can contribute or leverage as cost effective data collection, monitoring and evaluation tool		Partners identified and approached by end of January 2017	monthly

Tanzania

WS	Activity	Indicators	Year 3
1.4.1	Tool co-development (The model; PCV = desktop software; ApV=API	Functional model	**Milestone:** ApV produced for TZ, ET & NG by June 2017. **Output:** Tool available for use
1.4.2	Validation of prediction	No. calibration expts	**Milestone:** Validation of model predictions in ET and NG by December 2017; **Output:** Revised model available and manuscript written
1.4.3	Evaluate tool design	Meeting report and functional ApV	**Milestone:** ApV interface and design assessed by one user in FA in ET, NG & TZ by December 2017. **Output:** The ApV with new interface available for use
1.4.4	Institutionalizing tool	Hosting agreement	**Milestone:** Hosting & capacity development agreements signed in each country; capacity development & mentoring host institution staff by November 2017 **Output:** Agreements available, training materials available
1.4.5	Outscaling tool use	No. training & awareness events; no tool users	**Milestone:** Awareness and promotion strategy and materials for tools developed for each country; field days and one stakeholder meeting held to raise awareness of tool by November 2017. **Output:** Awareness creation events

Nigeria – WS3

1.3		Nutrient management tool available		3 year	
			Indicator	out put	Frequency /when
	1.3.1	Co-developed and validated nutrient expert derived tools for Ethiopia, Nigeria and Tanzania	No. of Evaluation trials	NE evaluation SOPs; NE V2	June -October
	1.3.2	Co-development of NE interfaces/applications	Interfaces available for different users	Different user defined interfaces	March/April
	1.3.3	Training extenison service providers	No. of extension trained	Reports	Feb. and May
	1.3.4	Improving protocols for collecting input data	Protocols available	Improved protocols develped	April
	1.3.5	Tool(s) developed	NE v2 available to potentail users	NE V2 developed	May
	1.3.6	Collection of feedback on NE from users	Yield and profit increased as a result of NE V2 recommendation	Feedback on the use of NE V2; Use of interfaces	October
	1.3.7	Meeting with national agencies to host tool	Signing of MOU	Report; MOU	February
	1.3.8	Roadmap for capacity dev't and hosting	Action points developed	Documents avaliable	March
	1.3.9	Training & support for hosting	No. of support staff trained	Capacity of support staff enhanced	May
	1.3.10	Meeting to raise awareness of Tool	No. of meetings	Reports	3 meetings in May, June and July

Participants List

Name of participant	Location	Email address
Andersson, Jens Anton	CIMMYT-CAP	J.Andersson@cgiar.org
Arnold Mushongi	Uyole	mushongi@yahoo.com
Balemi Tesfaye	CIMMYT-Ethiopia	T.Balemi@cgiar.org
Bernard Vanlauwe	IITA, Kenya	B.Vanlauwe@cgiar.org
Carol Mukundi	CIMMYT-Nairobi	C.Mukundi@cgiar.org
Gebreyes Gurmu	EIAR	gebreyes2004@yahoo.com
Henri Tonnang	CIMMYT-Nairobi	H.Tonnang@cgiar.org
Ibrahim Mohammed	IIITA, Nigeria	I.Mohammed@cgiar.org
Jairos Rurinda	IPNI Agronomist	jairurinda@yahoo.co.uk
Jibrin M. Jibrin	Director, CDA/BUK	Jibrin@gmail.com
Jordan Chamberlin	CIMMYT-Ethiopia	J.Chamberlin@cgiar.org
Julius Adewopo	IITA, Nigeria	j.adewopo@cgiar.org
Masuki K. Francis	CIMMYT	K.MASUKI@cgiar.org
Peter Craufurd	CIMMYT-Nairobi	P.Craufurd@cgiar.org
Rahel Assefa	CIMMYT-Ethiopia	r.assefa@cgiar.org