Taking Maize Agronomy to Scale in Africa (TAMASA)
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TAMASA

Aims

• Use spatially representative farm panel data to understand spatial & temporal variability of management decisions & production outcomes

• Work with Service Providers to identify & co-develop applications that transform data & information to useable products

• Test rigorously uptake & outcome of decision support based recommendations & agronomic interventions

• Increase capacity in agronomy at scale
TAMASA sampling frame

Representativeness?

- Maize x market x pop AOI
- $n \times 10 \times 10$ km pixels /
- $n \times 1 \times 1$ km cells /
- $n$ households or expts.

~750 HH panel survey
~ 400 NOT trials
What data does TAMASA have?

- Geo-referenced & ODK
- ~700 Nutrient Omission Trials
- ~ 200 Performance (NE validation) trials
- ~104 varieties grown in 72 experiments to predict phenology
- ~2600 plot & household panel survey [APS] (yield, soil, agronomy, plot & HH characteristics)
- ~ 4000 replicated crop cuts for yield
- ~ 4000 tissue samples (grain, ear leaf, stem)
Agronomy at scale?
What does taking Agronomy to Scale involve?

The *transformation* of the agronomic R&D and knowledge delivery landscape that results from the integration of (geo-spatially explicit) data collection at scale with the delivery of area or site specific agronomic advice by multiple service providers.

What would this transformed landscape look like?

**Current**
- Blanket recommendations
- Weak integration of available spatial data
- Limited reach and monitoring systems (*adoption, yields*)
- Limited tech. availability (*fertiliser blends*)

**Potential**
- Field/Area specific recommendations
- Real-time integration of available spatial data
- Reaching millions, and low-cost monitoring systems (*adoption, yields*)
- Technology availability

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**TAMASA** activities should contribute to this movement.

*How to move towards this vision?*

*How far to move? (appropriate scales)*
Agronomy at Scale; towards a stepwise framework (1 of 2)

- **What is the information gap (solution)?** Need to understand:
  - The decision-maker/user
  - **Scale** of their operations/implementation
  - **Institutionalisation** – the capacity of a user to support or host products

- **What data is needed and available at that scale?**
  - Data sources
  - Data collection at scale (incentives for collection)?
  - Modelling to improve targeting/solution identification
  - Geo-spatial sampling frame
Agronomy at Scale; towards a stepwise framework (2 of 2)

- **What analytics, models & tools or products are needed?**
  Product design and analytics need to consider the user & their institutional system

- **What data needs to be collected?**
  Understand causes of variation and uncertainty
  Scalable, low-cost and quick (accurate, repeatable and scale appropriate)
  Data management (near real-time spatial & temporal data)

- **Feedback and learning for users and tool improvement**
  User experience of interface to improve tool
  Automated capture of how the tool is used (and decisions if possible)
  Capture outcome
Advice generation at different scales

**Regional recommendation (blanket)**
- Data required:
  - Rainfall
  - Soil texture
  - Current yields

**NE - Area recommendation**
- Data required:
  - Mgt. history
  - Rainfall
  - Soil texture
  - Current yields

**NE - Field individual field recommendations**

**Users:**
- Maize commodity groups
- Input providers (BG/Propcom/...)
- Extension (group approach)

**Users:**
- Extension
- Farmers
Spatial *Ex Ante* Analytical Framework

- Framework for evaluating potential impacts of agronomic decision support tools across space
- Start with Nutrient Expert

Spatially varying model inputs & outputs

- Soils & rainfall parameters
- Fertilizer prices
- Labor costs
- Output prices

Baseline: business as usual
Alternative: NE recommendation
Yield impacts from SSNM (net revenue optimizing)

Baseline:
100 kg/ha NPK 14:14:14

Π-optimizing

Yield improvements from NE over baseline

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Applications for learning & monitoring
Applications

Maize Variety Selector
What to grow & where to get seed

Maize-Seed-Area
How much seed is needed & plant density advice
Crowd-sourcing by partners

Locations of ~1400 agro-dealers in Nigeria collected by 30 extension agents (500 in 3d) via ODK

General info
4 states: Kano, Kaduna, Katsina, Gombe
1 day Training
3 Days for Survey

Average Owner Age: ~43yrs (17 – 90 yrs range)

Varieties Carried: mode = 3, max = 7
Measuring & predicting yield
Measuring yield; quick & robust methods?

- Counting rows & columns
- Shelling, counting, weighing
- Stand & ear count (no. reproductive units/area)
- Plant height
- Ear digital photographs (wt/ear)
- Other suggestions?

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Yield prediction: scaling

Spatial yield predictions from plot measurements (UAV, hand-held NDVI)
Nutrient management

Very low and low nutrient levels were considered as deficient*. In order to tackle soil nutrient deficiency for agricultural soils in the region, 11 types of blended fertilizers are recommended; their area coverage is: NPKSZnB (29%), NPKSFeZnB (28%), NPKSB (10%), NPSFeZn (8%), NPSB (7.4%) and NPSZnB (6.8%), etc.

* 0 represents non-deficient areas and 1 represents deficient areas for seven selected soil parameter (shown above).
Nutrient management applications: what is needed?

Very site specific, high information requirement: IPNI NE

Large area, spatial, lower information requirement: Spatial QUEFTS

Spatial QUEFTS plus minimum contextual information:
TEXTURE
CURRENT YIELD
INVESTMENT LEVEL
and?
Current nutrient management activities

- Partners in Nigeria (SG2000) and Ethiopia (MoANR/ATA) are making recommendations for farmers
- Extension workers were trained & provided with phones with NE mobile version
- Ethiopia – about 700 individual recommendations made. Paired plots have been established
- Nigeria – 20 extension agents trained to deliver 600 recommendations
- Assessment of: (i) the application/user-experience; (ii) whether farmers use the recommendation (NG) or the benefit (ET)
- Evaluating new blends in NG (& TZ) with OCP
What matters

• We are trying to nudge & change behaviour
• Understanding users & their use of information for decision-making is key. Risk & decision making gap
• Basic agronomy is as important as variety & nutrients, especially for low-investment farmers
• Decision-making driven by the level of investment & return on investment – not target yields
• Scaling, especially with inputs, is limited by:
  – logistics;
  – capacity of intermediaries to learn & deliver messages (1AF use 500 EA per 100k farmers & train every week);
  – scientists capacity to learn & keep it simple!
To end - some questions

- *Norm or assumption:* (dense) data in small areas represents AOI. How many trials/observations do we need to represent AOI?

- What spatial and contextual data is needed for nutrient recommendations at: (i) District level or area; (ii) community area; & (iii) Field or plot level?

- How would you design an application (or paper version) for the above?

- What (other) spatial data do we need for agronomy at scale?