Collaborative evaluation opportunities in Africa RISING Phase II

Carlo Azzarri, IFPRI

Africa RISING Science for Impact Workshop
17-19 January 2017, Dar es Salaam, Tanzania

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1. Ex-ante evaluations

2. Scaling-up process evaluations

3. Ex-post evaluations

1. Ex-ante evaluations

- Integrated crop and bio-economic modelling: APSIM (with ICRISAT), DAHBSIM (with IAMM)

- DSSAT crop simulation modelling initial results for Zambia

  ->Ho-Young

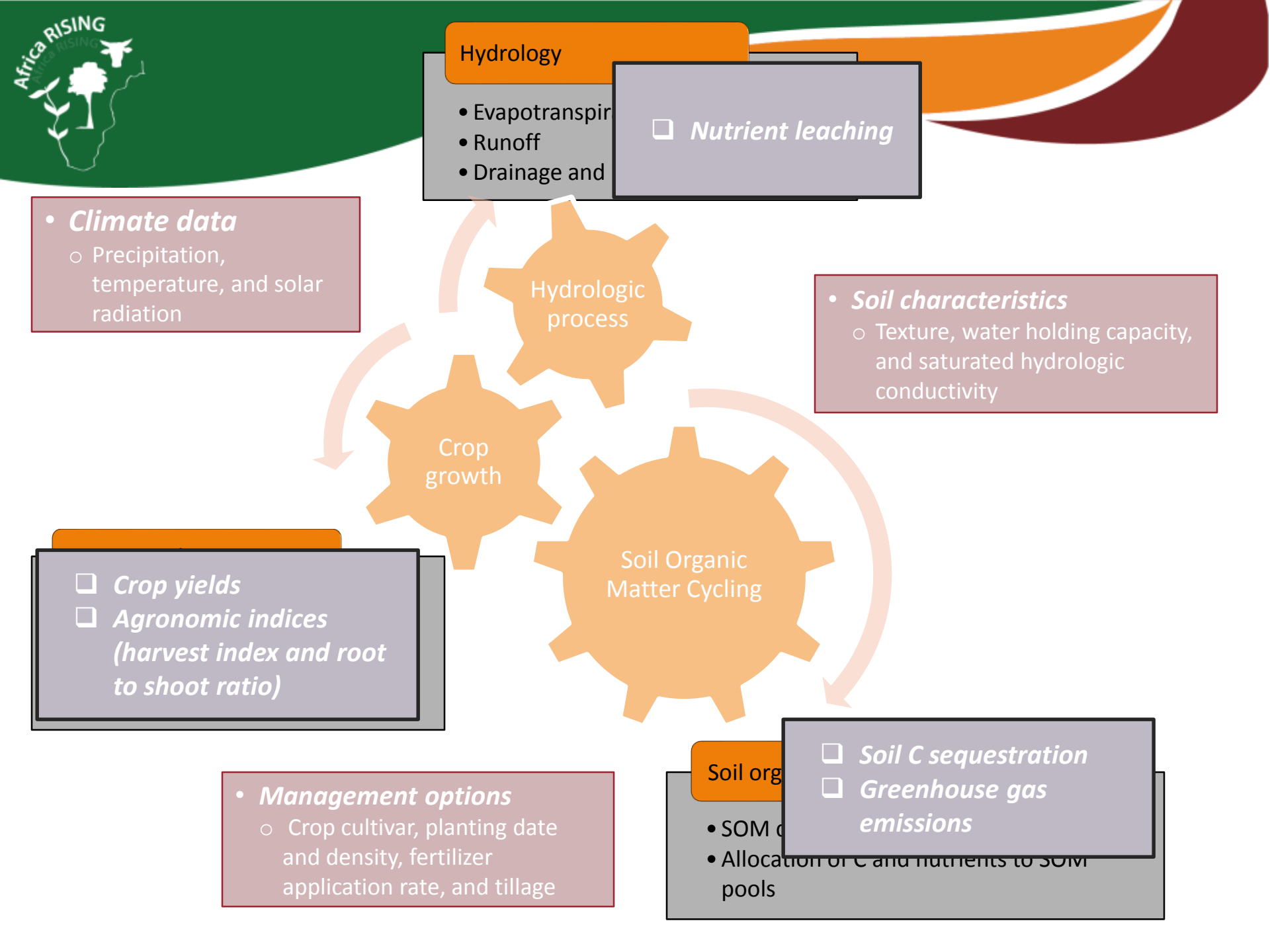
Ex-ante evaluation of AR innovations: an example for Zambia

- Fast ‘before-the-event’ evaluation that can
  - Represent and assess a large body of options via simulation
  - Identify innovative, alternative systems without the need for in-field assessments of all the possible options

Sadok, W., Angevin, F., Bergez, JE. et al. Agron. Sustain. Dev. (2009)

Components

- Biophysical models
  - Process-based simulation models have been used to assess productivity responses to various scenarios
- Data
  - Model calibration: adjust model setups on the basis of the measurements and prior knowledge
  - Model validation: evaluate the adequacy of the calibrated model on a data set which is different from the data set used for calibrating the model
- Scenarios
  - Interpretation/analyses of simulated outputs


Hydrology
• Evapotranspir
• Runoff
• Drainage and
❑ Nutrient leaching
• Climate data
○ Precipitation, temperature, and solar radiation
Hydrologic process
• Soil characteristics
○ Texture, water holding capacity, and saturated hydrologic conductivity
Crop growth
Soil Organic Matter Cycling
❑ Crop yields
❑ Agronomic indices (harvest index and root to shoot ratio)
Soil org
❑ Soil C sequestration
❑ Greenhouse gas emissions
• SOM
• Allocation of C and nutrients to SOM pools
• Management options
○ Crop cultivar, planting date and density, fertilizer application rate, and tillage

Preliminary study

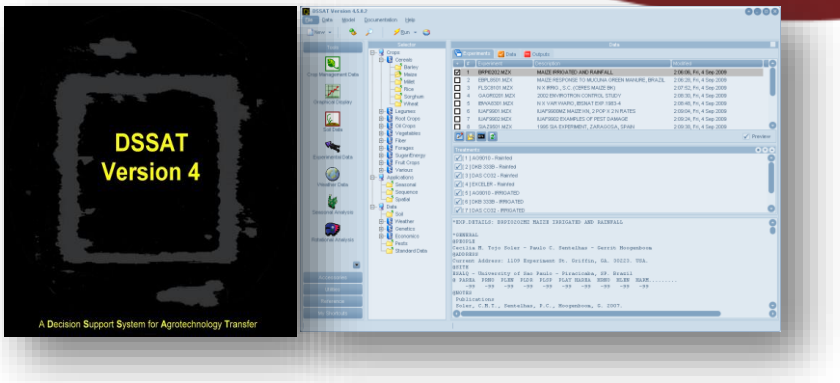
- Model calibration
  - Use biophysical model to best describe AR mother plot data
- AR mother plot data
  - Project title: Sustainable intensification of maize-legume-livestock integrated farming systems in East and Southern Africa (PI: Christian Thierfelder, CIMMYT)
  - Study title: Sustainable intensification of low-input agriculture systems in Zambia

Mother Plot Data

Site	Six camps (Chanje, Hoya, Kapara, Kawalala, Mtaya, Vuu)
Crop grown / Cropping system	Maize
Key treatments tested	Five maize cultivars (SC627, PAN53, DKC8053, PHB30G19, DKC8033) with CP (conventional tillage) and DS (direct seeding)
Information provided	Planting and harvesting dates, fertilization dates and rates, on-site daily precipitation, biomass and grain yields, and farmers' ID
Information guess-estimated	Daily solar radiation and temperature (NASA Climatology resource for agro-climatology), soil information
Crop model used	Decision Support System for Agrotechnology Transfer(DSSAT)

DSSAT

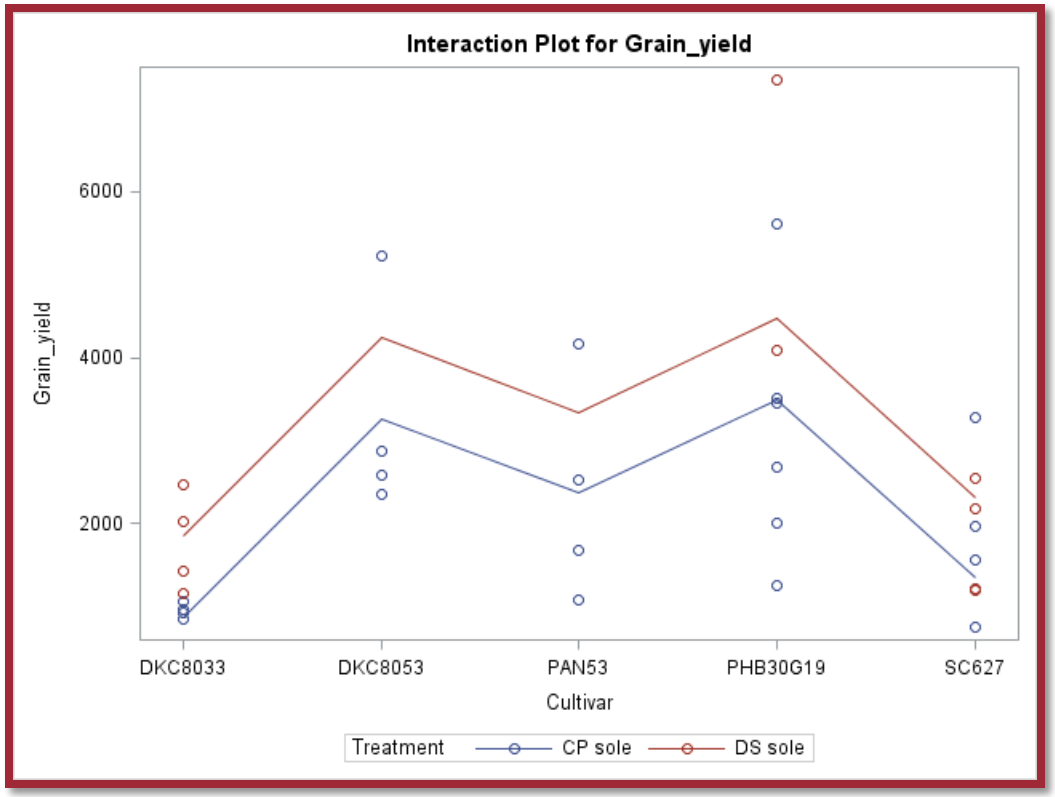
Decision Support System for Agrotechnology Transfer



- Research tool for crop production analyses
- Incorporates
  - Crop-soil-weather-management models
  - Utilities to help users integrate data with models
- CENTURY module simulates dynamics of soil organic matter and residue managements

- No capability to model inter-cropping systems

Statistics (grain = cultivar + treatment)



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The GLM Procedure

Dependent Variable: Grain_yield

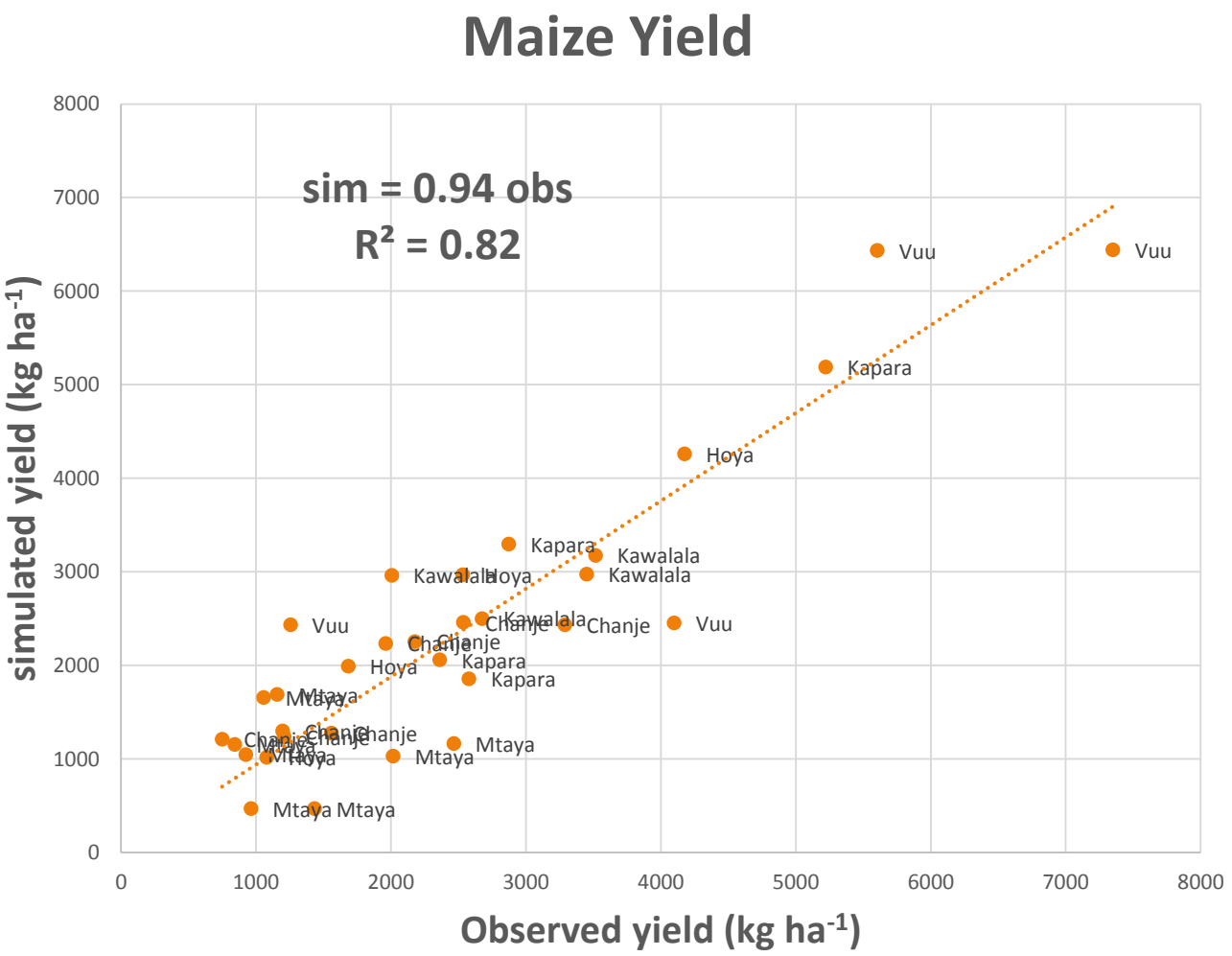
Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	5	33881331.75	6776266.35	4.44	0.0047
Error	26	39704217.75	1527085.30		
Corrected Total	31	73585549.50			

R-Square	Coeff Var	Root MSE	Grain_yield Mean
0.460435	50.70536	1235.753	2437.125

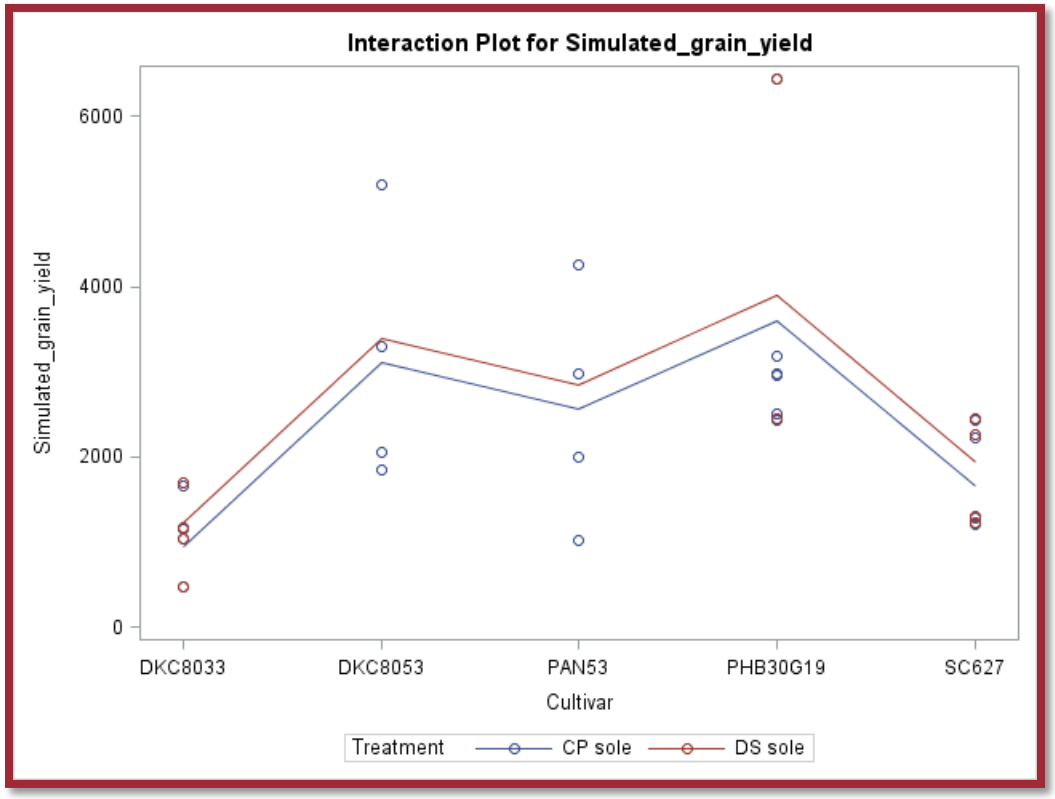
Source	DF	Type I SS	Mean Square	F Value	Pr > F
Cultivar	4	28615289.38	7153822.34	4.68	0.0056
Treatment	1	5266042.38	5266042.38	3.45	0.0747

Source	DF	Type III SS	Mean Square	F Value	Pr > F
Cultivar	4	33648295.67	8412073.92	5.51	0.0024
Treatment	1	5266042.38	5266042.38	3.45	0.0747

Simulated results



Statistics (simulated grain = cultivar + treatment)



The SAS System 17:15 Monday, January 16, 2017 2

The GLM Procedure

Dependent Variable: Simulated_grain_yield

Source	DF	Sum of Squares	Mean Square	F Value	Pr > F
Model	5	32105686.55	6421137.31	4.49	0.0044
Error	26	37143675.80	1428602.92		
Corrected Total	31	69249362.35			

R-Square	Coeff Var	Root MSE	Simulated_grain_yield Mean
0.463624	50.94079	1195.242	2346.335

Source	DF	Type I SS	Mean Square	F Value	Pr > F
Cultivar	4	31634189.24	7908547.31	5.54	0.0023
Treatment	1	471497.30	471497.30	0.33	0.5706

Source	DF	Type III SS	Mean Square	F Value	Pr > F
Cultivar	4	30820232.15	7705058.04	5.39	0.0027
Treatment	1	471497.30	471497.30	0.33	0.5706

What next?

- Model validation
  - Test if “calibrated” model is able to describe AR baby plot data
  - If necessary, re-calibrate the model through model/data improvements
- Model application
  - Conduct further ex ante evaluation of AR innovations for i) scaling up AR innovations, ii) economic analysis, and iii) climate change scenarios

Potential and pending issues/1

- Rich data sources
  - Key information measured and available
  - Various AR innovations
  - Wide ranges of locations (soil/weather/cropping systems)

- Model selection strategies
  - Search better models for specific cropping systems / research questions

Potential and pending issues/2

- Model calibration and validation

  Require more details on mother/baby trial plots

- The Zambia ex-ante analysis has highlighted some ag trial data needs.
- Some research teams will be contacted to fill the gap in the data submitted onto CKAN (e.g., trial protocol, cropping calendar, measurement units,…)

2. **Scaling-up process** evaluations

- To gauge progress in scaling-up activities towards achieving the 1M target (!)
- To understand implementation challenges and lessons learned (both for AR researchers and development partners)
- Generate evidence on the trajectory of success of alternative scaling up approaches across regional projects
- Let's make sure to start off with the right foot from day 1! Though, it's a learning process…

3. **Ex-post** evaluations

- Better opportunities for designing and implementing ex-post evaluations during scaling up, through stronger collaboration
- Analysis of causal effects of selected AR innovations using experimental (also with pipeline methods) and quasi-experimental designs
- Chances of submitting solid Impact Evaluation proposals for external funding (e.g., 3ie, DFID, SPIA,…), increasing AR exposure

3. **Ex-post** evaluations -Examples

Opportunities for experimental studies in **Ethiopia**

1. Integrated farm-decision support system (IDSS) with seasonal and intra-seasonal weather forecast (Kindie et al.)
    - Causal effects of IDSS on farmers' risk aversion and knowledge, technology adoption, income
2. Small scale mechanization (SSM) (Walter et al.)
    - Causal effects of SSM on drudgery, labour productivity, yields, rural employment

Asante sana!

Questions?

Questions for a round table discussion

- What do you think is the biggest challenge in:
  - Project/program evaluation and learning?

- What would you like to see more of?
- What would you like to see less of?
- Which evaluation and learning tasks/output/activities do you think our team should focus on?

Acknowledgements

Thank You

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