



Excellence in Agronomy
for Sustainable
Intensification and
Climate Change Adaptation



Excellence in Agronomy

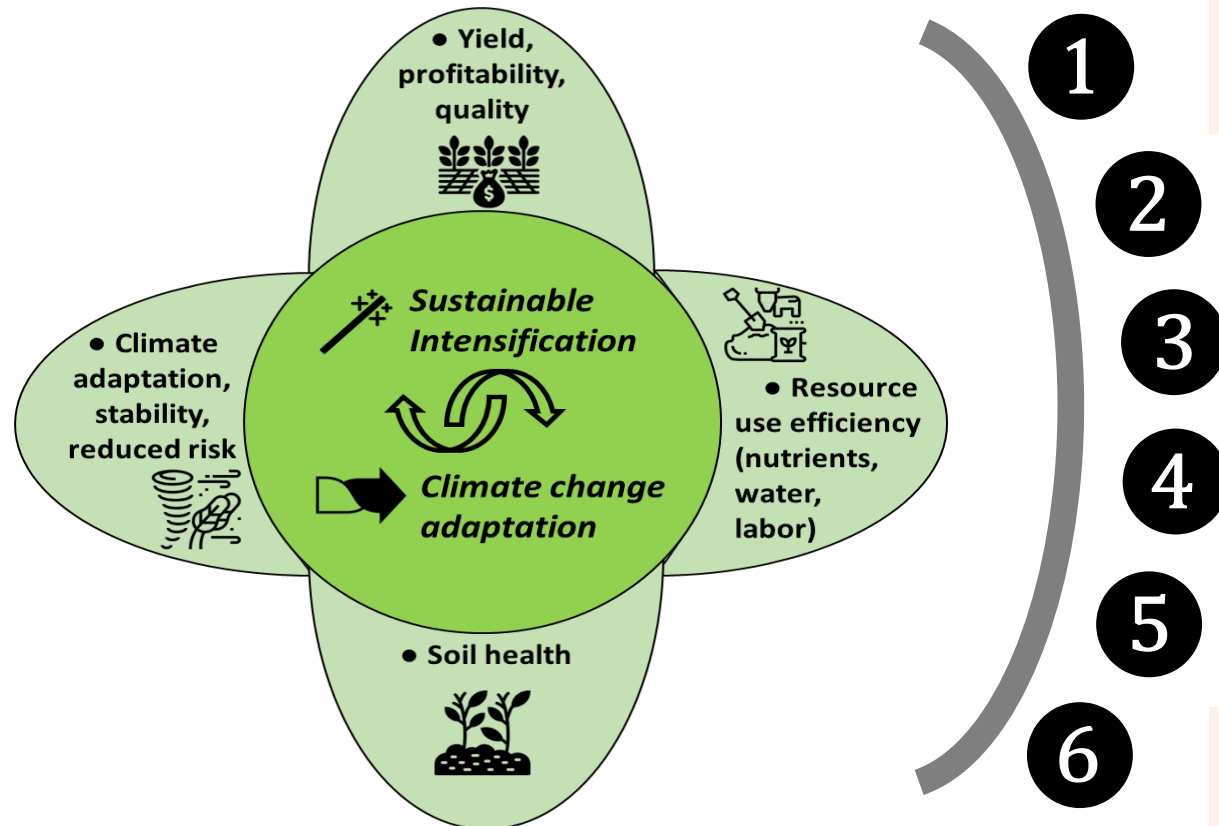
Initiative Status March 2023

Six dimensions of EIA



Challenge: Agronomy has not delivered on its potential at scale... low and variable yields... limited adaptation to climate change... low resource use efficiencies... declining soil health...

Response: Modernized agronomy around sustainable intensification & climate change adaptation... to deliver agronomic gain at scale



1 A globally organized R&D community operating with increased efficiencies

2 A R&D agenda driven by demand from scaling partners

3 Standardized, FAIR, open data and tools

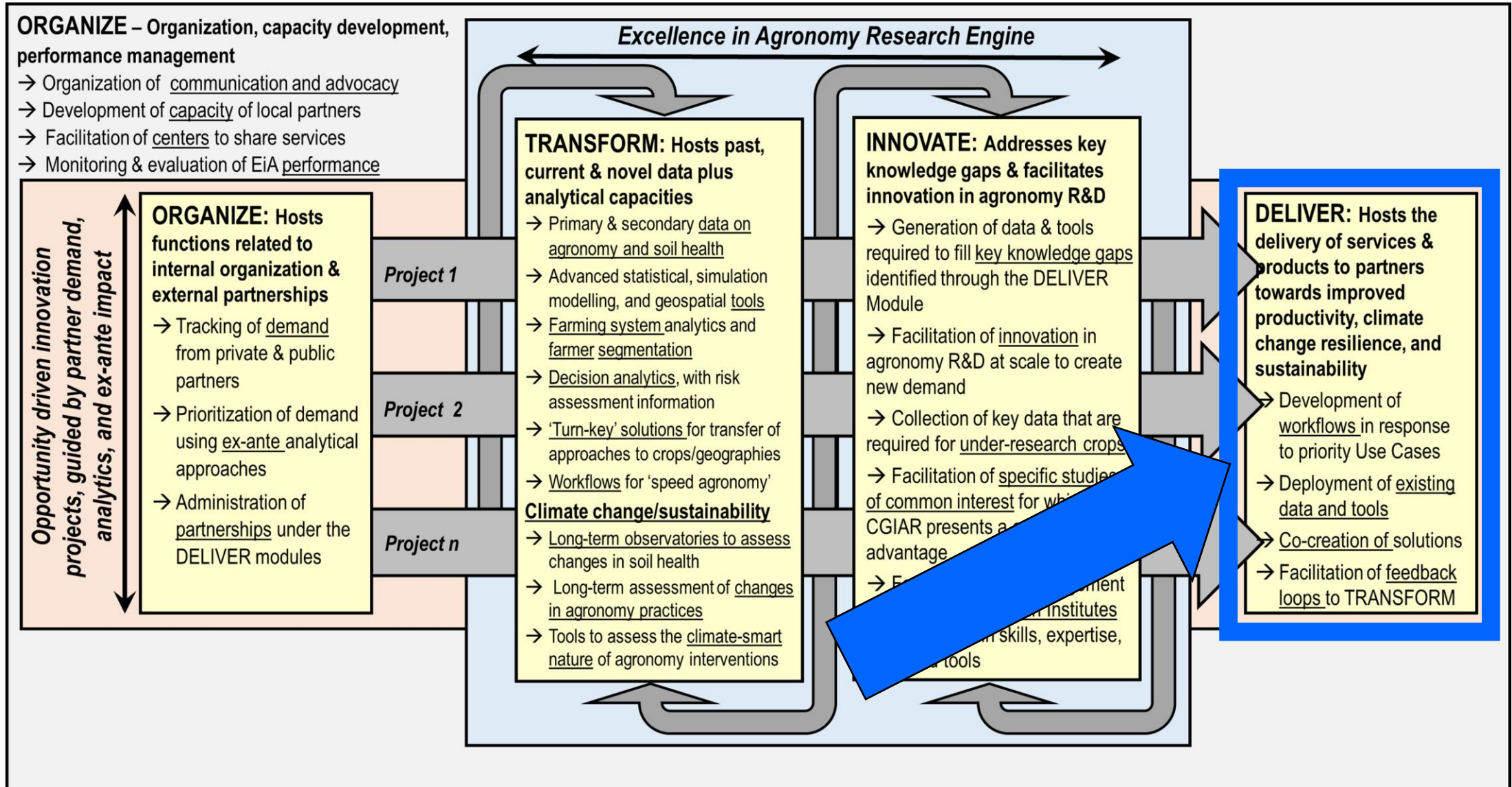
4 Conscious integration of technological advances

5 Operationalization of a holistic agronomic gain assessment framework

6 Process innovation based on agile and informed decision-making

EiA Work Packages

4 Interlinked Work Packages




DELIVER- Cohort I and II Use Cases




- Cohort I Use Cases
- Cohort II Use Cases


Ghana. Cropping calendar advisories for smallholder maize farmers and extension agents in the Guinea Savannah zone



Nigeria. Co-development of digital solutions to deliver fertilizer and time of planting advice for rice, maize, and cassava



Egypt. Web-based advisory for in-season yield potential & water productivity of irrigated wheat-based systems




Rwanda. Accelerating the use of digital tools for delivering agronomic advice in potato-based cropping systems




Ethiopia. Co-development of targeted fertilizer advisory services to improve NUE, reduce cost and enhance productivity




Ghana. Testing hyperlocal digital agronomic advisory services and the delivery pathways in rice-based cropping systems




Ethiopia. Co-development of agronomy and climate advisory tools for high yielding and high quality wheat production




India. Managing time in the rice-based cropping systems of South Asia




Mexico, Columbia, Peru. Smart farming systems at the local level: Sustainability assessment and targeted data-driven recommendations for smallholder farmers




Cambodia. Optimizing productivity, profitability and environmental sustainability using mechanized and precise direct-seeded rice




Morocco. Scaling conservation agriculture systems in Morocco across 1million hectares of farmland.




Vietnam. Optimizing productivity, profitability and environmental sustainability using mechanized and precise direct-seeded rice.



Ghana : Developing a site-specific fertilizer recommendation system in Northern Ghana for southern farmers in maize legume systems




Kenya. Availing digital advisory content through an easily searchable content hub for farmer support organizations.




Ghana. Strengthening climate resilience in cocoa systems in Ghana and West Africa through agronomic support services.




DRC. Supporting diversification and climate resilience in coffee systems through improved agronomy and advisory services




Ghana/Cameroon, Cote d'Ivoire, Nigeria. Building a context specific ISFM in cocoa systems in West Africa through agronomic support services




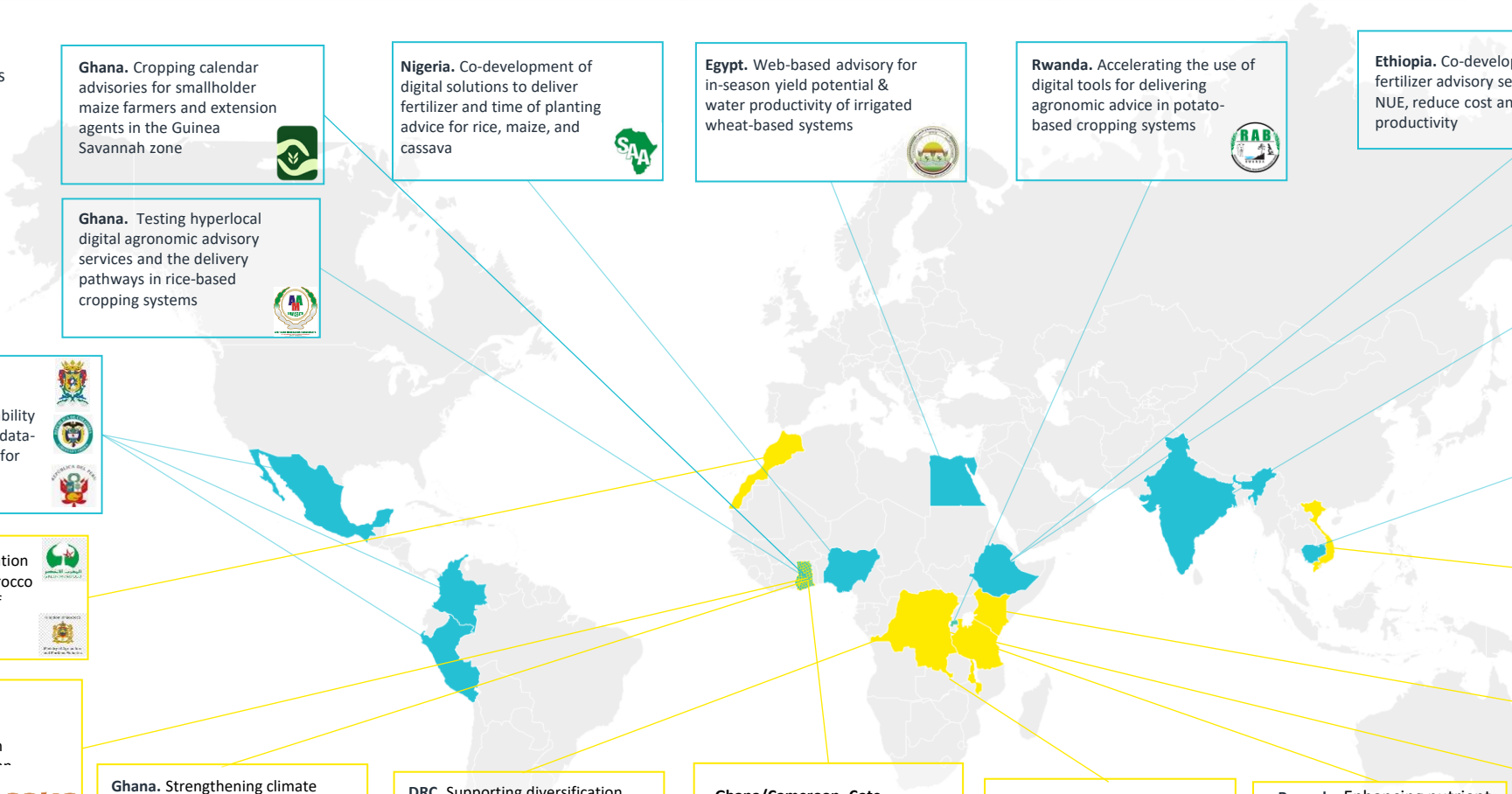
Malawi. Improved soybean digitally mediated agronomic advisory to improve yields, soil health and incomes.



Rwanda. Enhancing nutrient use efficiency through site specific nutrient advisories within funded clients.



Enhancing good agricultural practices in vegetable and cereal producers in the ESA and WCA regions

Use Case | Digital Green Ethiopia



Demand partner(ship)s

Data

Analytics

MVP (DST)

Validation

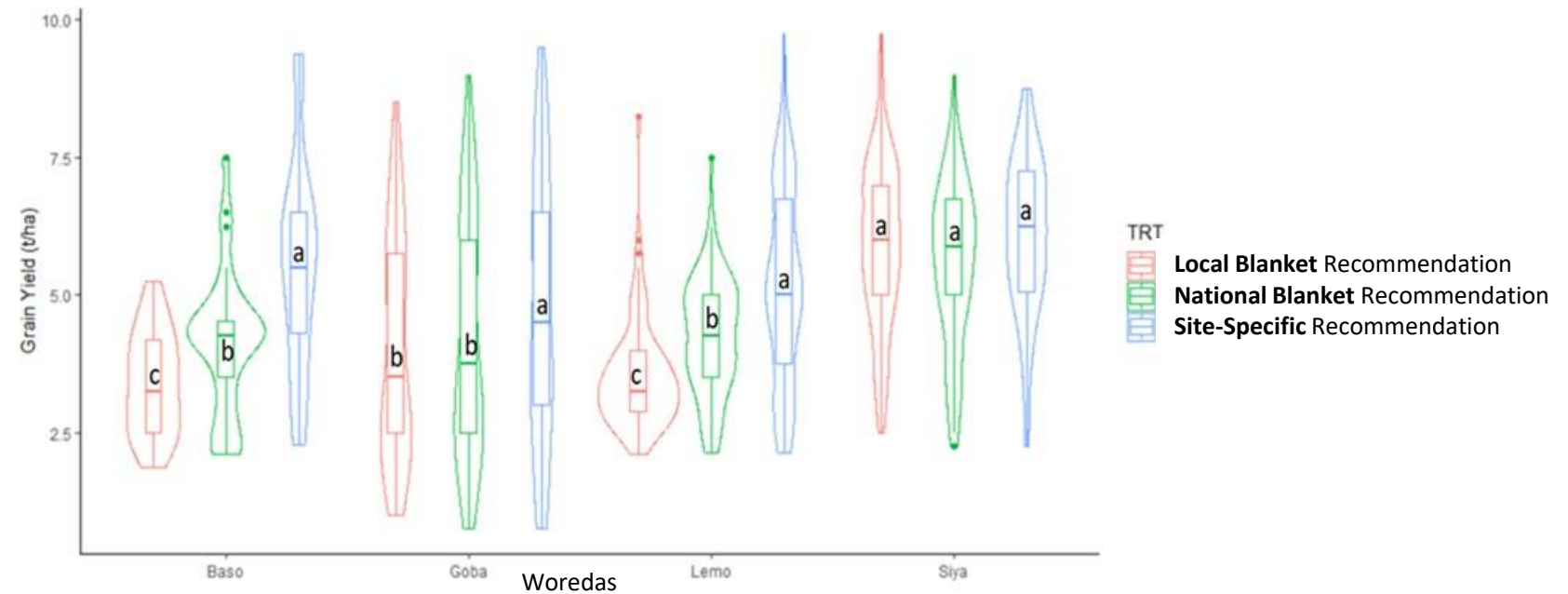
Piloting

MVP

Yield gains

NextGen AgroAdvisory Tool

A fertilizer recommendation decision support tool that is **location, context, and season intelligent**. It provides **advise on fertilizer type, amount, and time of application** in wheat growing regions of Ethiopia. It is data driven, based on **systematic integration of large legacy agronomic data** (collated throughout Ethiopia), and corresponding covariates using **machine learning algorithms**.



The validation results shows that **yield**, profitability, NUE, WUE in the new advisory are significantly higher than the blanket recommendation and local control. For instance, there is **12-25% yield gain**, depending the woreda.

Use Case | Digital Green Ethiopia



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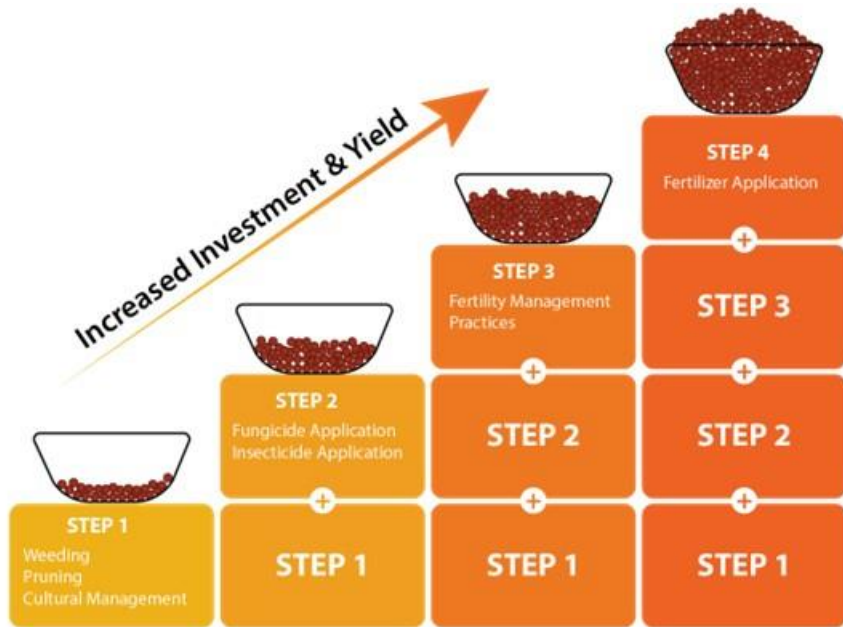
- **Use Case has reached piloting stage in 5 woredas; 8k farmers reach; 3384 farmers implemented site specific fertilizer advisory in wheat producing areas in the Ethiopian Highlands. Digital Green, MoA and LERSHA participated as partners.**

Region	Woreda	Target kebeles	Kebeles with Pico	Registered farmers	Actual Reach	Adoption
				(Target: 12,500)		
SNNP	Lemo	25	15	5,926	1,346	2,600
SNNP	Markeo	16	6	3,565	946	344
Amhara	Basona Warena	20	17	7,820	1,489	144
Amhara	Siyadebir	7	5	2,185	2,649	214
Oromia	Goba	12	9	4,541	1,575	85
Total		80	52	24,037	7,987 (63.9%)	3,387 (42.4%)

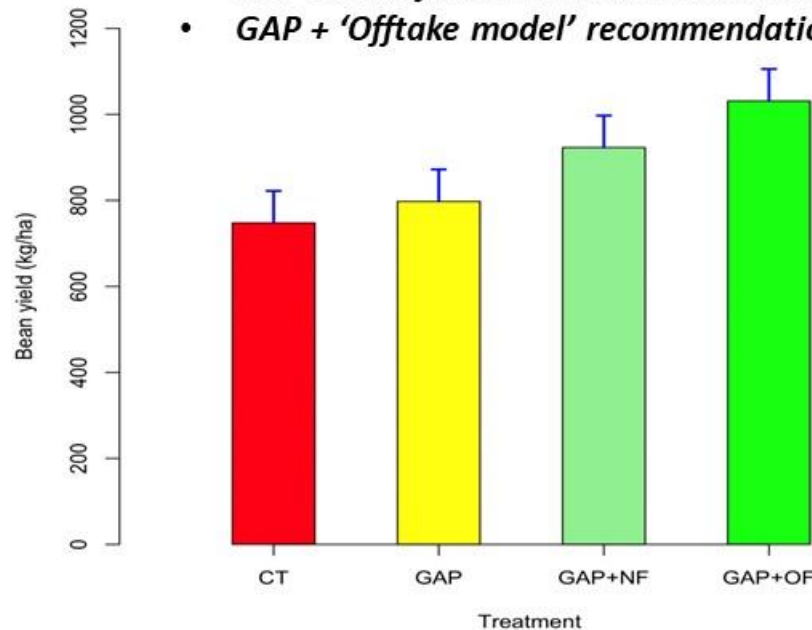
- **Partners** co-piloted advisory based on EiA Decision Support Tool in **5 woredas**. **Dissemination** was based on **maps, videos, and SMS and IVR when possible**.
- Digital Green interested to reach out up to 80 woredas (100,000 households) in the coming years, MoA expressing interest on the way to **integrate to the national scale, private sector (LERSHA) already tested** on three sites and will engage in scaling widely the coming season (MoU under development).

DELIVER – CocoaSoils Use Case

- To develop a **STEPWISE** approach to deliver integrated soil fertility management practices adapted to the needs of smallholder cocoa producers in West Africa (Cameroon, Cote d'Ivoire, Ghana, Nigeria)



- Control (+insecticide)
- Good Agricultural practice (pruning, full pest control)
- GAP + local fertilizer recommendation
- GAP + 'Offtake model' recommendation



CSC Dashboard

Best Management Practices Q/A

Do you apply fertiliser? ? Yes No

Amount of fertilizer (kg) applied per acre/hectare

How many times do you fertilize in a year?

Type of Fertilizer applied?

Amount of Calcium (Ca) applied?

Amount of Magnesium (Mg) applied?

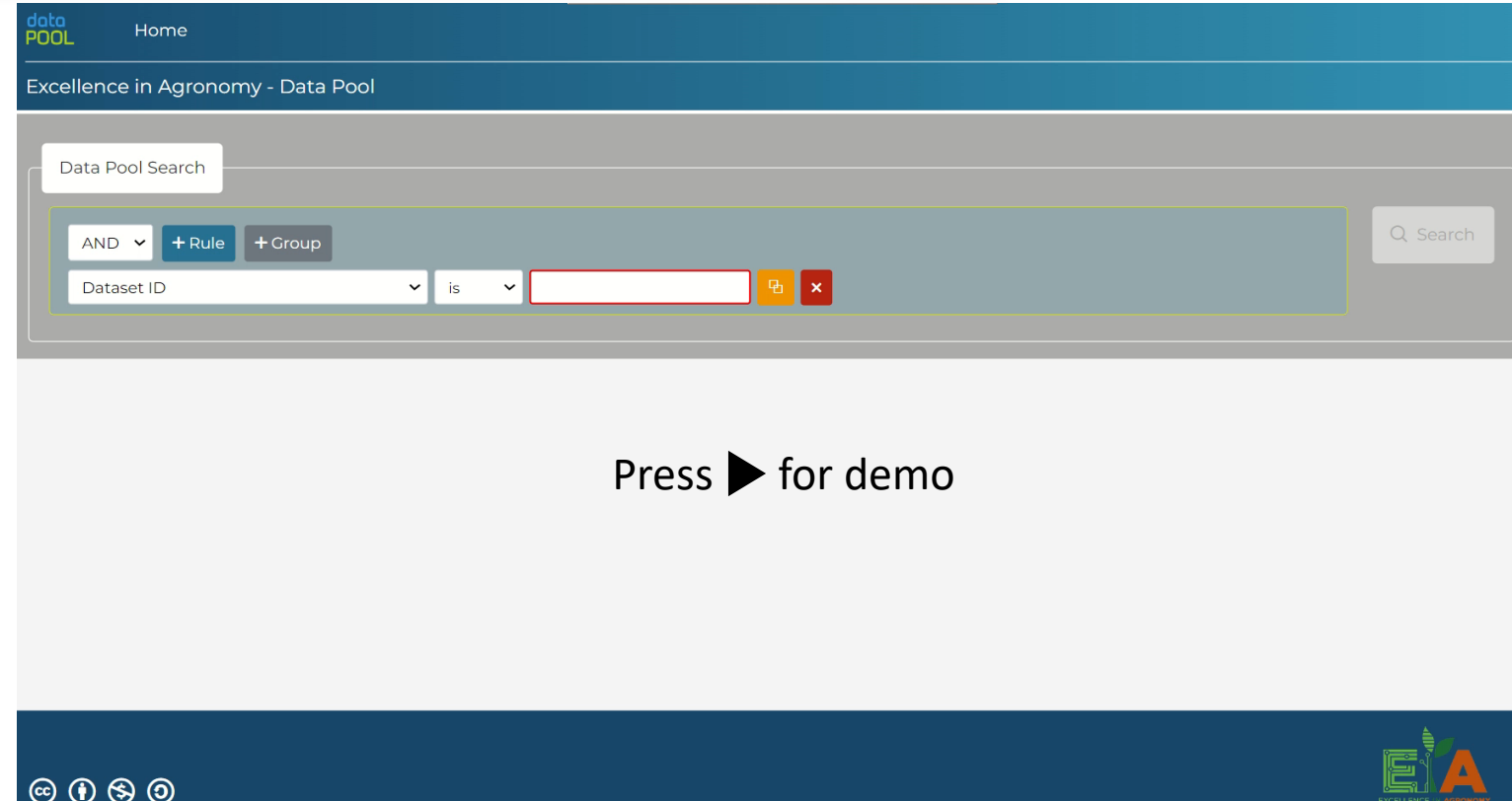
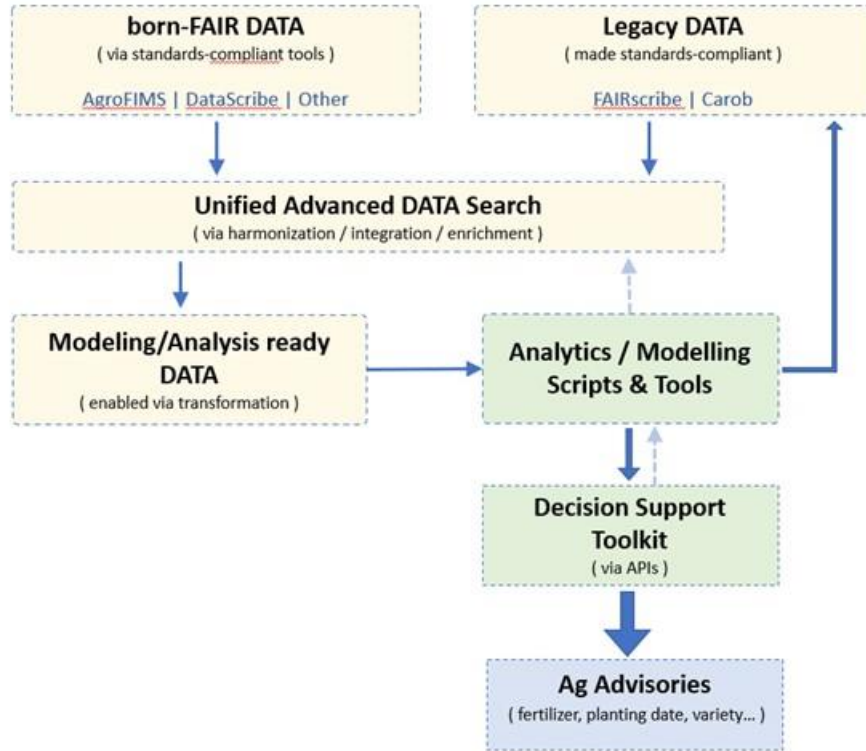
Amount of Sulphur (S) applied?

GENERATE ASSESSMENT

CSC Dashboard Calendar Management



TRANSFORM - Standards-compliant data infrastructure critical for Agronomy 2.0



Data & analytics tools, infrastructure

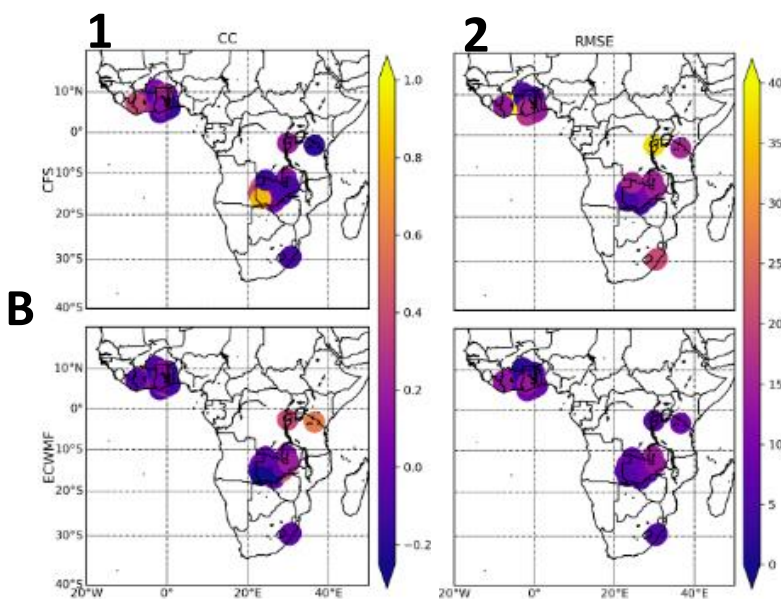
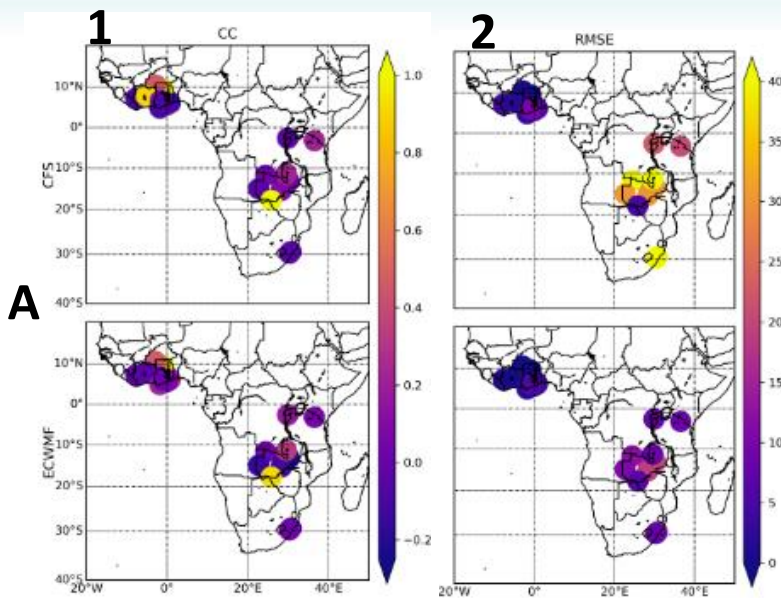
- Tools to enable digital collection of FAIR agronomic data...
- ...and FAIRification of high-value legacy data
- CG Labs collaborative computing for low bandwidths

Interoperable, open data = quicker insights

Unified advanced data search PoC demo

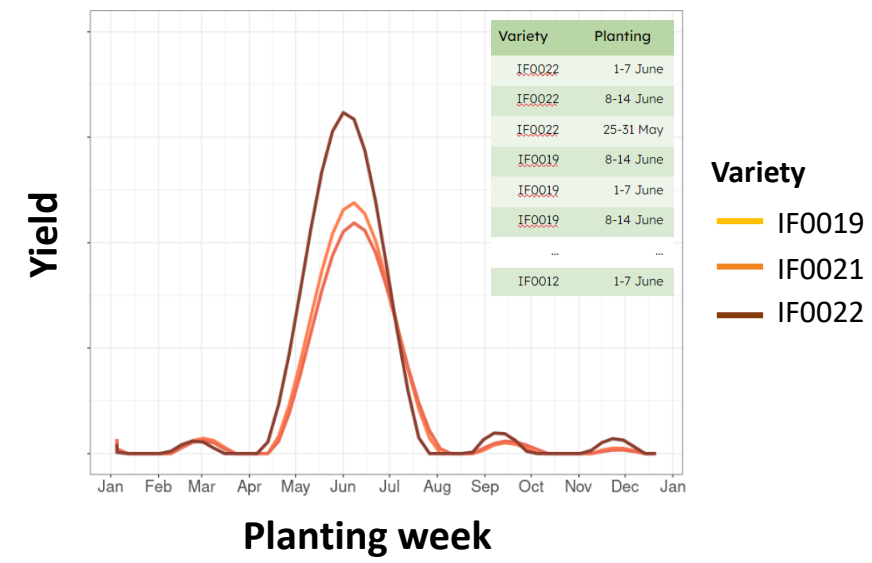
- Standards-compliant FAIR data is searched and aggregated (by crop, country, gender, fertilizer...)
 - APIs for access to tabular data and geo-data (for spatial analyses)
- Aggregated data is downloadable in crop model/analytics ready formats**

TRANSFORM - Comparative assessment and relevance of weather forecast products



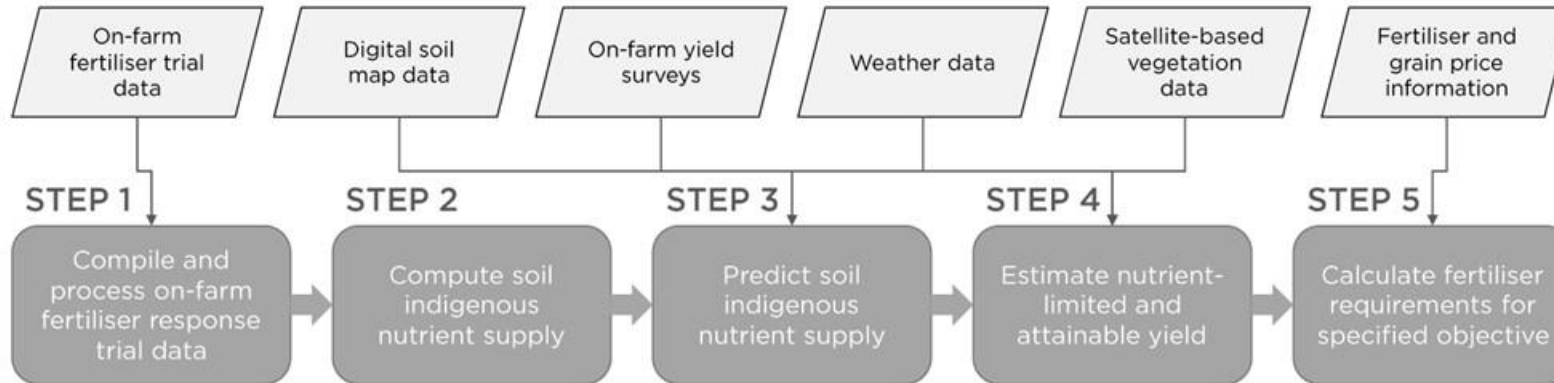
There are many forecast products – good decision support often requires knowing which is the most accurate...

- Two products assessed for accuracy of daily rainfall predications: CFS (NOAA) & ECWMF
- Two methodologies: Coefficient of correlation (R^2 ; high = better – column 1) and Root Mean Squares Error (RMSE; high = worse – column 2)
- Applied to months 1 (A) and 3 (B) that farmer received forecasts (not necessarily correlated with rain onset periods)
- In general, CFS performs better than ECWMF
- Longer-term daily rainfall predictions at 3 months (B) are more uncertain than predications at 1 month (A)

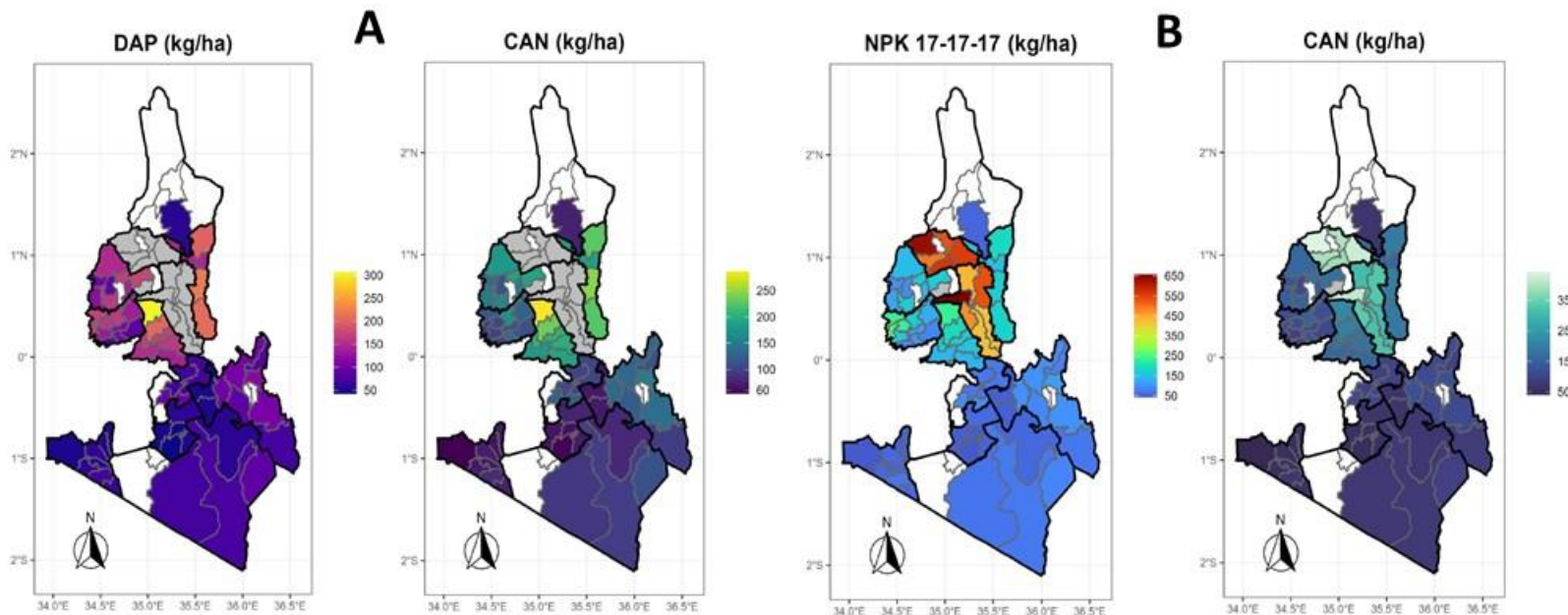


- Example of optimal planting date recommendation developed for maize varieties used in the Nigeria Use Case
- **Accurate forecasts are critical to make such recommendations, or derive value from them (e.g., fertilizer application timing)**

TRANSFORM – Proof of Concept of fertilizer recommendations for 11 counties in Kenya



Step 1. On-farm standardized trial data
Step 2. Optimization algorithm for indigenous N, P, K explaining yield response
Step 3. ML over iSDA, ISRIC soil data to predict indigenous N, P, K supply
Step 4. Empirical or predicted nutrient-limited (baseline) and attainable-yield (ceiling) used; improved using satellite data
Step 5. QUEFTS used to predict yield response to desired fertilizer



Maps indicate recommended rates of (A) DAP (basal) + CAN (topdress) and (B) NPK + CAN for a 30% increase over current maize grain yields by sub-county

**can be optimized for RoI rather than increase in yield*

INNOVATE – R&D progress highlights



CAPTain – the Climate Adaptation Prioritization Tool

Purpose designed **regional prioritization** and discussion tool to **challenge assumptions** and **engage audiences** in comparing research and investment priorities.

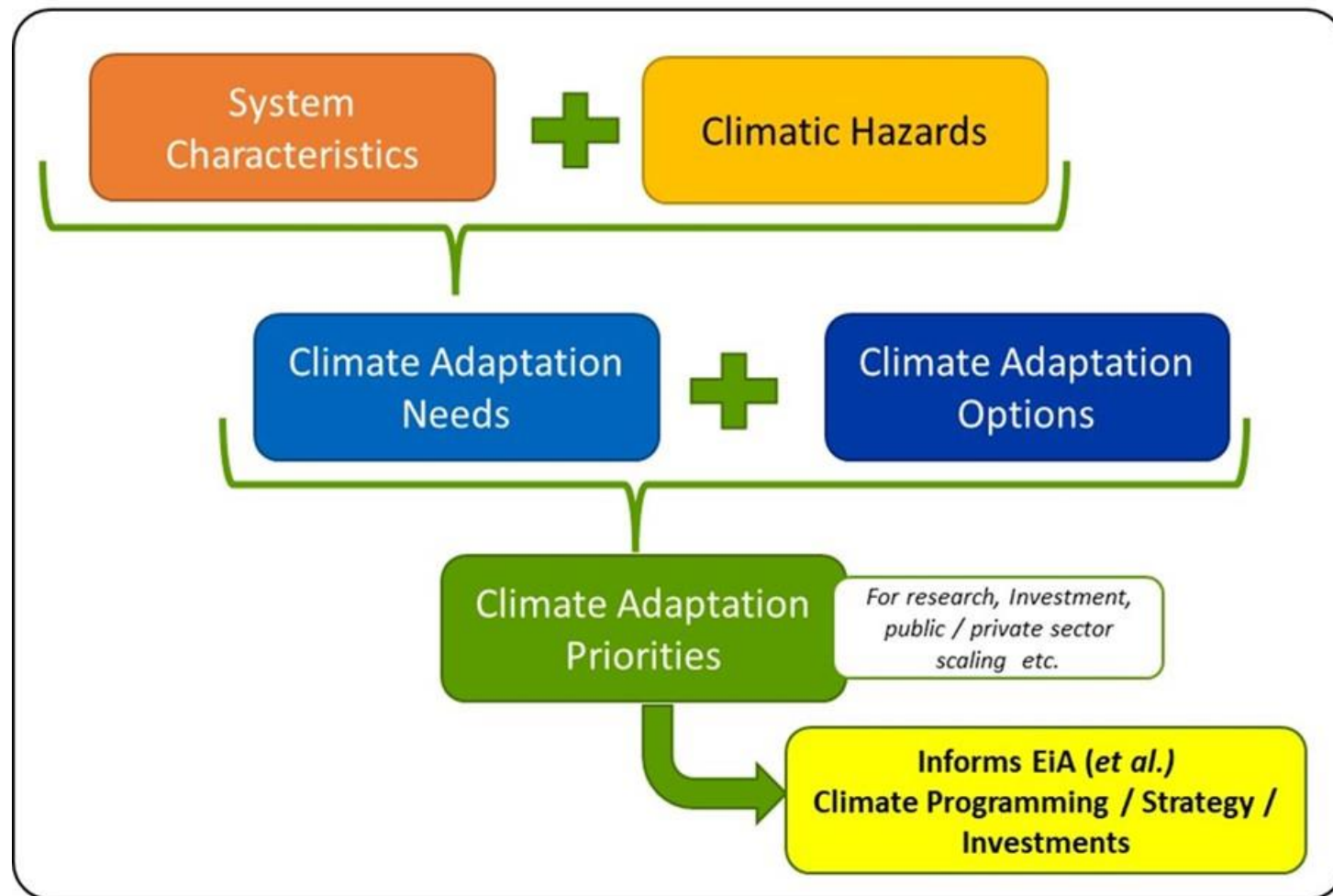
- Excel Macro based tool; tool in Beta finalization
- Piloted across multiple locations in India, Nepal, Bangladesh with EiA, TAFSSA and Rupantar projects
- Used in BMGF climate convening 1-2 Feb 2023

The Climate Adaptation Prioritisation Tool (The CAPTain)

Version 2.0 - December 2022

CAPTain Problem Statement	The impacts of climate change are well explored in various regions. Less focus has been undertaken in participatory approaches to categorise and prioritise solutions to help communities adapt to their expected impacts. Many interventions are based on internal decision that lack participatory appraisal or discussion. The CAPTain aims to provide a process through which stakeholders can collaboratively learn, share, discuss and collectively prioritise potential climatic challenges and their adaptation options.
CAPTain Approach	Using expert elicitation, CAPTain applies a structured approach to explore potential solutions in a selected location. This helps collaboratively prioritise policy and programmatic approaches to climate adaptation and provides a participatory process to help bring stakeholders together to discuss priorities in a structured way.
CAPTain Outputs	[Module 1] Contextualisation of key crops and other farm enterprises; [Module 2] Prioritisation of key climate risks and their relationship to key crops and other farm enterprises; [Module 3] Evaluating potential response options.
CAPTain Implementation	While Module 1 is pre-populated before the workshop and trusted during the workshop, the remaining modules are aimed at generating discussion and consensus. This is to be done in small groups of between 4 and 6. Larger groups should be partitioned according. The ideal group will have a diversity of experiences within a target location to enable a broad discussion. A facilitator will be assigned in order to help guide the group through the tool, who has experience in the tool development and implementation process (and will have previously used the tool in at least five different workshops).
CAPTain Acknowledgements	The CAPTain is a collaboration brought together by the Excellence in Agronomy (EiA) 2030 program. Further support has been contributed by the Cereal System Intensification for South Asia (CSISA - BMGF) program, the Transforming Food Systems in South Asia (TAFSSA - CGIAR) program and the 'Rupantar - transforming food systems on the Eastern Gangetic Plains' project (IACR). The following organisations have so far contributed to the development process: CIMMYT, Cornell University, IRRI, CRIDA.
CAPTain Citation	Brown, B., McDonald, A.M. et al (2022) The Climate Adaptation Prioritisation Tool (CAPTain) as a stocktaking and prioritisation exercise to aid in climate adaptation initiatives.
Contact	We welcome feedback - Contact Dr. Brendan Brown - brendan.brown@outlook.com Click here to progress to 'How To Use This Tool'

Run across various target Agro-ecologies



INNOVATE – R&D progress highlights



Yield at scale R&D projects aim to generate innovative approaches using remote sensing and rapid & low-cost ground truth data collection to determine yield at scale. Current three projects include:

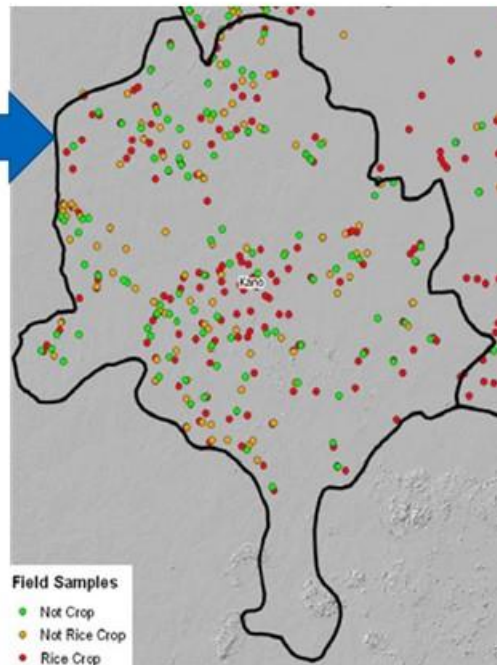
- Large-scale yield gap estimation and characterization with multi-source remote sensing data for rainfed **wheat** in Ethiopia
- Scalability of remote sensing-based models for **maize** yield estimation across sub-Saharan Africa
- Estimation of **rice** area and yield, and assessment of limiting factors based on remote sensing and rice growth simulation in Nigeria



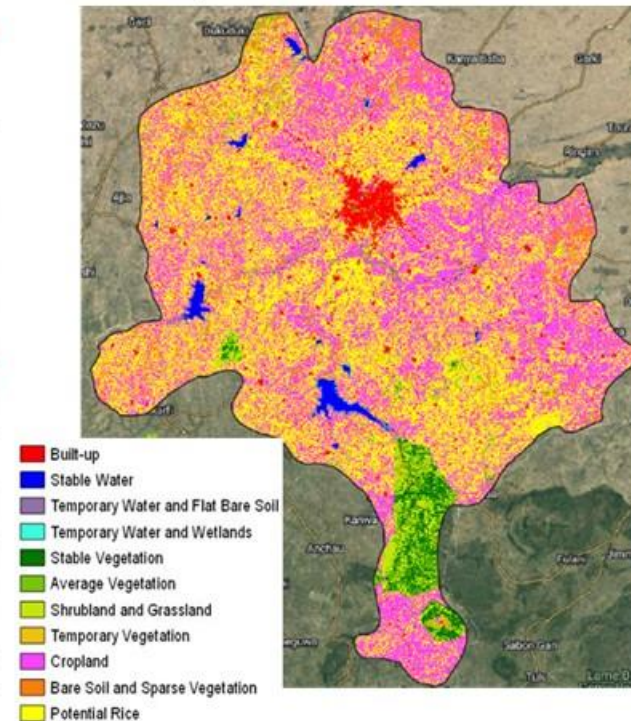
Workflow

1. Collection of ground-truth agronomic information
2. Identification of seasonal rice cultivated area and rice phenology
3. Calibration of crop simulation model
4. Yield estimation by remote-sensing & crop simulation model
5. Identification of rice area and yield limiting factors

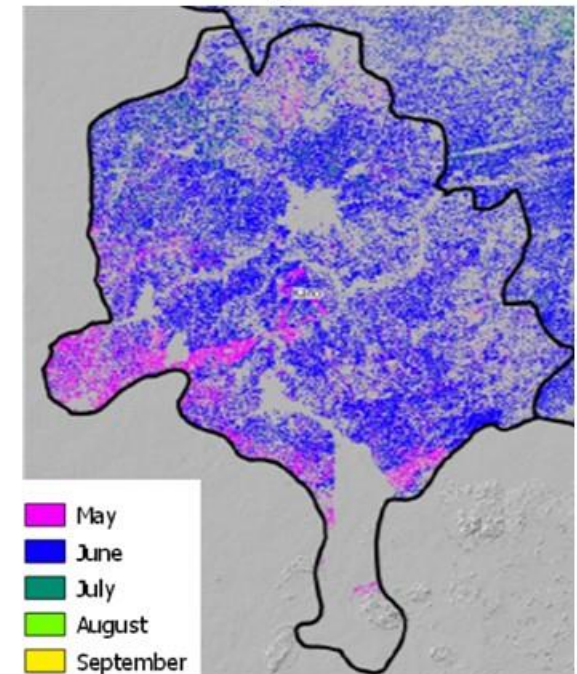
Ground-truth data collection



potential rice area



Planting month in wet season



2022 output: Maps of rice area and planting month in Kano, Nigeria

ORGANIZE - What the work package does



ADD-ONS

Increasing impact potential

Yield gap decomposition

Farmer segmentation

Gender and youth responsiveness

Climate adaptation & mitigation potential

Ex-ante impact assessment

Use Case

- Demand partner (public or private)
- Active extension network
- Support partners
- Specific solution (Minimum Viable Product)
- Co-creation process
- Turnkey solution for scaling



Productivity



Resource use efficiency



Yield stability/
reduced risk



Soil health

Agronomic Gain KPI
Assessment

Baseline/panel studies

RCT studies

Impact assessment

EiA's collaborations with other Initiatives



Agro Ecology, Nature+, SI-MFS

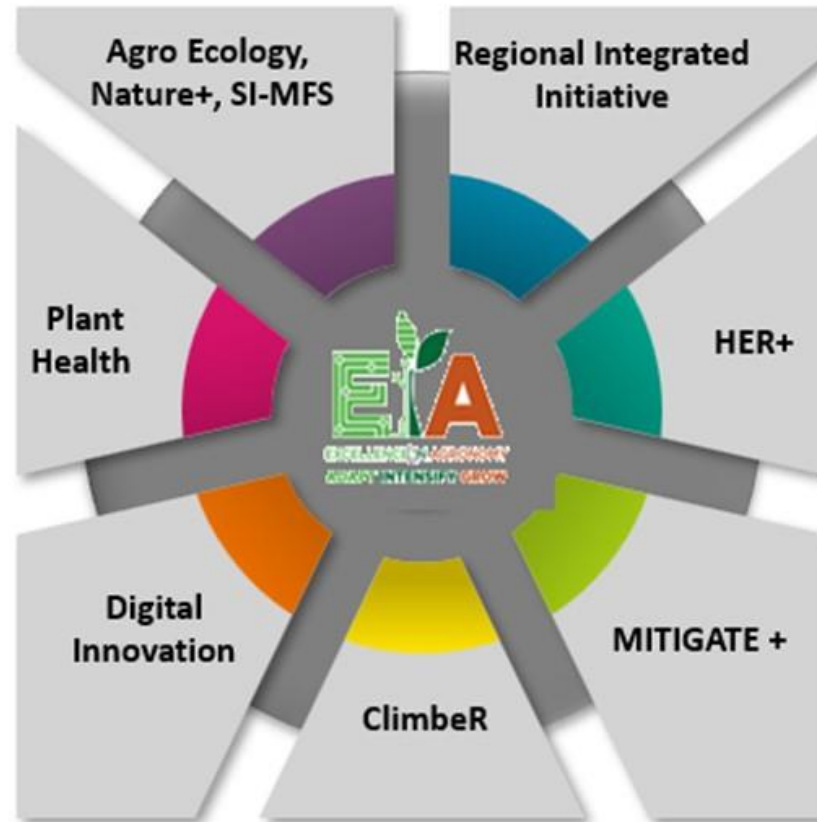
- ✓ Common themes (M&E) Framework
- ✓ cooperation on segmentation and inclusiveness
- ✓ Strategy paper on CGIAR 's response to SI, AE , NPS, et al

Plant Health

- ✓ Crop health as a common theme
- ✓ Cooperation in pest surveillance and integrated insect pest, weed and disease management

Digital Innovation

- ✓ Common analytics infrastructure and interoperable agronomic data
- ✓ Testing and co-development of tools for data management and reuse



ClimbeR

- ✓ Scaling of climate adaptive agronomic solution

Regional Integrated Initiative

- ✓ Respond to agronomy –related demand in the regions and
- ✓ Cooperate on specific topics through the EiA Regional programs

HER+

- ✓ Joint activity on making Use Cases youth-gender-responsive
- ✓ Randomized Control Trial on gender transformation action

MITIGATE +

- ✓ Soil health and GHG emissions as common themes
- ✓ Cooperation in the areas of simulation modelling

Thank you!

