STARS —
Aardobservatie ten dienste van kleinschalige landbouw in Afrika en Azië

GeoBuzz
Den Bosch, November 26th, 2014
Project synopsis

Spatial information is revolutionizing Agriculture in Global North but not in Global South.

Here, important adoption barriers exist: heterogeneity.

**STARS**: coordinated effort to

- learn,
- identify opportunities, constraints & risks,
- test hypotheses

around potential exploitation of RS technology in crop-based production systems and livelihoods of smallholders.
Project facts

• Five partners: ITC, CSIRO, ICRISAT, University of Maryland, CIMMYT
• 20 months = 1 or 2 crop seasons
• Budget $8.2 million, of which $7.5 million as BMGF grant
• Supported by DigitalGlobe & RapidEye data & knowledge contracts, and Esri sw contract
• Started June 1, 2014
• Various subgrants/-contracts: Uni Sokoine, ESIPPS, Manobi, CEGIS, ...
• Links with other initiatives: VitalSigns, AfSIS, CIP, Cereal Systems for South Asia (CSISA), Drylands Systems CRP, National Food Security Department Tanzania
Objectives

• Better understand why RS has not been taken up for SHA, and which investments are required to unlock potential.

• Demand-driven experimental use cases where currently poor information is the norm, and where RS-based workflows can help improve.

• Match private sector partners (sat data/spa analysis) with public sector actors and public good objectives.
Background

- Globally, already 1 in 2 people live in big cities; will be 2 in 3 by 2050.
- The world has a growing food challenge.
- Also: Farmers can expect growing markets.
Background

• Globally, 3 in 4 poor people are rural smallholder farmers.

• Smallholders are not usually included in food production chains, let alone in value chains.

• Sub-Saharan Africa has 183 million hectares in use for agriculture; some 451 million hectares of arable land remain unused: more than half of the world’s remaining arable land resources.
STARS characteristics

• *Learning grant* for five global partners
• *Demand-driven science:*
  – Which info-products do stakeholders need?
  – Can we *improve the infoconomy* around SHA?
• On *promise* of remote sensing to *transform* smallholder agriculture
• Intelligent *risk taking* and *making use of the mobile/internet revolution*
• *Fully equipped* with latest technology
Main hypotheses

We think we can

• *monitor crop growth* within the small farms of sub-Saharan Africa and Southern Asia, *using time-series remote sensing*.

If achievable, this will

• allow *improved outlooks for crop yields* throughout the season, *informing policy-makers*, and

• ensure more effective evidence-based advisory services at the farm scale, *informing farmers and agro-business*. 
Three facets

Sustainable models of realization

Ground-based, airborne, and spaceborne monitoring throughout the crop season

Information products that inform & transform agricultural processes
Challenges

Heterogeneity in
- Crop systems
- Crops and varieties
- Soils and soil applicants
- Climatic conditions
- Farm field practices and consistency
  - Farm field delineation
  - Tillage and planting system
  - Rain-fed vs irrigated
  - Use of fertilizers
  - Use of mechanization
Compared to northern ag

- Smallholder farming in Africa/Asia is a *data-poor* context; there are many facets of the production systems that we do not know.
- Tanzania 2008 maize bumper crop
- Much ground truthing required
Challenge of intercropping

**Intercropping** =
Growing multiple crops on the same land, with purpose to create larger yields, or mutual support of crops grown.

- **Principle**: Crops should not compete for space, nutrients, water, or sunlight. Sometimes companion crops can help each other (support, nutrients, pest control).
- **Examples**: deep root + shallow root, tall + short, light-loving + shade-loving
- Crop separation can be done in 2d/3d space and/or in time.
Where we will work

Stakeholder approaches:
bottom-up

top-down

mid-level
Regional experiments

**W Africa:** land tenure security & investment climate  
**E Africa:** national production statistics  
**S Asia:** water pump market & irrigation services

**All:** Household surveys  
Field delineation  
Crop system recognition  
Crop recognition  
Crop health recognition

**S Asia:** saline/freshwater balance when irrigating

**W Africa:** farmer & her community  
**E Africa:** national food security offices  
**S Asia:** private sector  
**Global:** consumers
W African value propositions
Remote Sensing of Agriculture in Tanzania for Food Security Monitoring

Partners:

MAFC: Ministry of Agriculture Food Security and Cooperatives
UMD: University of Maryland
SUA: Sokoine University of Agriculture
ESIPPS: Environmental Surveys, Information, Planning & Policy Systems
IIASA: International Institute for Applied Systems Analysis
MANOBI
AAIC: Agricultural Assessments Intnl. Corp.
FEWSNet
AfSIS
E African value propositions

Users
- Ministry of Agriculture
- Government planners for ag development
- Agricultural development agencies
- National Bureau of Statistics (NBS)
- Crop Insurance companies

Crop traders
- Extension agents
- Vital Signs, AfSIS, CIP

Methodologies for classifying
- Cropland
- Maize production systems

Relative NDVI/Crop Condition at MODIS and Landsat resolution

Prototype of Agricultural Areas Base Map (Cropland Mask)

Ground-truth land-cover and land-cover dynamics

Time Series (one season)

Satellite Time Series Pipeline and Archive

RapidEye/Digital Globe

UAV

Field Data

Test Sites

MODIS

Landsat
SE Asia value proposition

*Irrigation Scheduling Advisories with Satellite Technology for Bangladesh*

Partners
- CIMMYT
- CEGIS: Center for Geographic Information
- IWM: Institute for Water Modeling
- BIID: Bangladesh Institute of ICT in Development
- BWDB: Bangladesh Water Development Board
- BADC: Bangladesh Agricultural Development Corporation
- DAE: Department of Agricultural Extension
- iDE: International Development Enterprises
• Analyse at macro/meso-scales the surface water availability to determine safe operation space and best bet areas for technology targeting.

• Develop irrigation scheduling services for maize, wheat, rice and mungbean.
Cutting edge technology
Public good outcomes

• Landscaping study — CSIRO & partners
  Aim to understand
  – the decision-making environment for key stakeholders
  – the pathways for agricultural development that are likely to emerge
  – the nature of the infrastructure systems needed for delivering the right information to the right stakeholders at the right time.

• Crop Spectrotemporal Signature Library
  – Spectral info for crops followed over time
  – Accompanying farm field data

• Image analysis algorithm repository
  – Data ingestion workflows
  – Analytical workflows
Outcomes connected with

- **Crop Monitor**
  Crop Monitor component for Tanzania developed by UMD (Becker/Dempewolf) under STARS

- **JECAM**
  Joint Experiment for Crop Assessment and Monitoring
  - STARS field protocols are superset of JECAM’s protocols (UCL/Defourny, UMD/Becker, all teams)
  - Sites in Tanzania, Mali, Nigeria will be registered as JECAM sites

- **STARS Advocacy efforts**
  - Knowledge portal on RS4SHA
  - Partnering with ag-related agencies in Africa/Asia
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