Nation-Wide Agriculture Monitoring for Food Security in Tanzania and Uganda

Partners

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Office of the Prime Minister, Uganda
Lutheran World Relief
Gutsinda Development Group

STARS Results Sharing Workshop
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Food Security Monitoring

Information has to be **Timely and Accurate**

- Agricultural production Market supply
- Warehouse
- Import/export
- Infrastructure e.g. roads
- Amount in Storage
- Food prices
- Incomes
- Food consumption
- Coping strategies
- Food quality
- Malnutrition
- Disease outbreaks
- Sanitation

The Four Main Components of Food Security

1. **Availability**
   - There is a reliable and consistent source of quality food.

2. **Access**
   - People have sufficient resources to produce and/or purchase food.

3. **Utilization**
   - People have the knowledge and basic sanitary conditions to choose, prepare, and distribute food in a way that results in good nutrition.

4. **Stability**
   - People’s ability to access and utilize food that remains stable and sustained over time.
AgriSense-STS Project Goal

• Support **smallholder farmer** livelihoods and food security in Tanzania and Uganda

• Develop solutions and build capacity for providing **timely, transparent information** on agricultural prospects to policy makers in order to inform agricultural decisions and policy

• Leverage **technical innovations** including remote sensing, smart phone and internet technologies
Pathway

Improve timeliness and reliability of information on agriculture using Remote sensing Smart phones/tablets Internet technology working with Government (MALF/NFSD) & Universities (SUA) (Tanzania) Office of the Prime Minister & Makerere University (Uganda) to Inform agricultural decisions and policy, agricultural development initiatives, markets, etc.
**Tools**

1. **Field data** collected on **Android tablets** and delivered promptly from the field; testing data collection from UAVs
2. **Satellite data** and information that is consistent, quantitative and timely for food security monitoring
3. **Crop Monitor portal** as a comprehensive, standardized system for monthly data compilation by the NFSD Team

**End Users**

- Government planners for agricultural development
- Agricultural development agencies
- National Bureau of Statistics (NBS)
- Private sector: Crop Insurance companies, traders
- Extension agents
1. Electronic Field Data Collection

**ODK Specifications:**

- Use regular Android tablets, so far engaging 109 agents in Morogoro and 49 in Iringa, and 77 in Masaka Uganda
- The software is free and customizable for any data collection needs
- Developing Internet based database for easy sharing and access
- Electronic forms can be re-designed and implemented based on USER’s needs

**Applications:**

- Evidence base for MALF
- Used to support of Disaster Risk Financing at OPM
2. GLAM Satellite Data Portal

- User-friendly, **automated** portal directly connected to **free** NASA image data feed through the internet
- Provides 8-day and 16-day maps of crop condition for all areas of Tanzania and Uganda
- Generates graphs showing the development of crop condition in time
- Automatically highlights critical areas in the country
- Used for monitoring and reporting by MALF - Local Server at MALF
- Used in support of **Disaster Risk Financing at OPM** - Local Server to be purchased and further developed under DRF
3. Crop Monitor Portal

- Standardized and efficient online system for monthly compilation of agricultural assessments
- Central place for data analysis and agriculture evaluation
- Same tool already used internationally by G20 countries
- Customized Crop Monitor developed for Tanzania,
- Ready to be deployed in other countries e.g with MAAIF in Uganda
Mapping Tanzania Croplands

- Tanzania: 105 Landsat tiles
- Data: Landsat 2010-2013 time series
- Data composited using cloud free pixels of multi-spectral and thermal Landsat 5, 7 and 8 data (Potapov, 2015)
- Methods: decision tree classifiers to relate rank-based multi-spectral, multi-temporal metrics to cropland/no cropland training data.
- Result: A per 30m pixel probability of cropland class membership threshold at >=50%
Maize classified map from WorldView-2 satellite image time series for Njombe, TZ.
Aerial UAV Photomosaics

In support of ground data collection
1. Field boundary delineation
2. Crop type identification
3. Ground truth
4. Crop condition
5. Treatment experiments

senseFly eBee UAV imagery, 4 cm resolution, Gongoni Ward, Kilosa District, 19. April 2015
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<td>PLOT 5/2: FERTILIZER PANNER 3M-01</td>
<td>PLOT 5/3: FERTILIZER PANNER 3M-01 &amp; PIGEON PEA</td>
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SUA experimental fields

RGB

NDVI

2-day 11/3/2016
29-d 7/4/2016
37-d 15/4/2016
45-d 23/4/2016
Output: National Food Security Bulletin

- Standardized, monthly report of MALF on Agriculture and Food Security in Tanzania
- The primary information source for government, public and private institutions
- Builds on partner efforts e.g FAO, WFP assessments done with MALF
- Monthly drafts produced for internal evaluation by NFSD team since October 2015
Rainfall Performance during June, 2016

Seasonal dry conditions continued to prevail in the country. Only few pockets of rainfall observed, especially during the first dekad over Lake Victoria, Tanganyika, Morogoro and Lindi as shown in Figure 1 below (satellite rainfall estimates from GeoWRSI model merged with gauge data from Tanzania rainfall stations network showing total rainfall performance). In Figure 2 (Rainfall performance during as percentage of long term average); most of the country experienced below normal (brown legend) attributed to seasonal dry conditions as shown. However, some of the areas experienced normal while a few places of Mara, Arusha, Tanga, Lindi, Mtwara and northern part of Morogoro experienced above normal rainfall conditions.

Agrometeorological Impacts during June:
Maize crop in highland areas of the bimodal area (Kilimanjaro, Arusha and Tanga regions) was reported in average condition during the first dekad despite dry conditions. The cold and calm conditions protected maize crop from wilting but affected growth and development rate. However, the situation became worse during the month due to the prolonged seasonal dry conditions. Farmers were therefore mostly engaged in out of season activities including crops harvesting and drying. Pasture and water availability for livestock and wildlife on the other hand was generally average in many places of the country.

Weather Outlook during July, 2016:
Dry season is expecting to prevail over the entire country. However, off season rains due to topographic, lake and ocean influence may occur in surrounding areas especially during second half of the period. Cold conditions associated with periods of strong winds are also expected. Rains are expected to be below normal.

Agrometeorological outlook during June, 2016:
With expected prevailing seasonal dry conditions across the country during July, 2016 farmers are advised to continue with out of season activities such as crops harvesting, drying and proper storage management.
Key Lessons

1. **Usefulness and Applicability**
   - Clear use case for remote sensing, smart phone and internet tools for agricultural monitoring

2. **Feasibility and Affordability**
   - New technologies are easy and feasible to implement and deliver higher quality data at lower cost

3. **Sustainability**
   - a) Inclusion of bulletin and electronic field data collection in government procedures (ASDP II)
   - b) Partnerships between government, universities, private sector (PPP)
Going Forward

• Continue to support NFSD/ MALF Tanzania
• Continue to support OPM Uganda
• Expand near real-time monitoring
• Engage with Regional Partners - RCMRD, IGAD-ICPAC
• Expand collaboration with partners e.g. Lutheran World Relief (LWR), Gutsinda
• Continue to advance remote sensing methods for crop conditions monitoring e.g better and dynamic land-use products suitable for operational use
• Regional capacity building and training
A big, big thank you to our partners including:

- Extension Agents in Morogoro, Iringa and Masaka Uganda
- Ministry of Agriculture, Food Security and Cooperatives, National Food Security Division, Tanzania
- Office of the Prime Minister, Uganda
- Sokoine University of Agriculture, Department of Agricultural Engineering & Land Planning
- University of Dar es Salaam
- Makerere University Kampala
- Environmental Surveys, Information, Planning and Policy Systems (ESIPPS)
- Lutheran World Relief
- Gutsinda Development Group
Asante!