Remote Sensing for Resilience of Food Security in sub-Saharan Africa

Purpose: Benefits of satellite derived information for food security

Executive Summary

Datasets derived from satellite earth observation (EO) or remote sensing (RS) offer a cost-effective approach to data collection that supplements datasets from field collection. Remote sensing enables scientists, policy makers and planners to get an overview of the environmental status, to observe changes over time, and to assess the extent to which the trends of these changes differ from historical baselines, offering a better understanding of the world.

How does custom remote sensing analysis contribute to the resilience of food security in Africa?

What datasets derived from remote sensing are publicly available?

There are an increasing number of remote sensing datasets that are freely available through online data portals. Datasets derived from these images include land cover, vegetation types, tree cover canopy, forest loss, land use, climate, and atmospheric datasets.

What does custom RS do?

Custom remote sensing analyses can provide objective and repetitive information over your area of interest exactly fitted to your project needs. Moreover, it can provide access to remote areas that are not covered well by freely available datasets as well as historical data at specific time intervals and spatial resolutions. Rapid growth in available satellite earth observation data and users of these data constantly increases the value of these products. These data can be integrated with existing field data to add value to your knowledge of your area of interest.

How does it do it?

Data can be requested (at cost) for specific points in the future, and historical imagery can be analyzed to see changes or trends over time, many data sources are freely available and can go to areas that are difficult to reach or could be dangerous to visit.

Why should it be done now?

RS can tell us a lot about the earth's surface, but these data should be cross-checked on the ground. Setting a baseline will assist to paint a picture of the present, that can be verified in the field, to compare to future years. This is how we can understand change over time and trends of change.

How has it been used to evaluate the resilience of food security?

- As an early warning tool allowing governments and other stakeholders to respond in time to projected declines in agricultural production (anomalies in rainfall, biomass production, vegetation trends)
- Identify priority areas for restoration or sustainable land management (regreening and degradation trends)

Key questions to consider

What is the area of interest?

Spatial coverage – remote sensing has greatly increased the areas of the globe where we can gather information, expanding into remote areas that would be difficult to collect on the ground and allowing the sampling of large areas at once.

How much detail do we need?

Spatial resolution – resolution of data products can vary, from sub-meter pixels to 10 x 10km pixels. The ideal resolution can be determined by the size of the area under review and level of detail required.

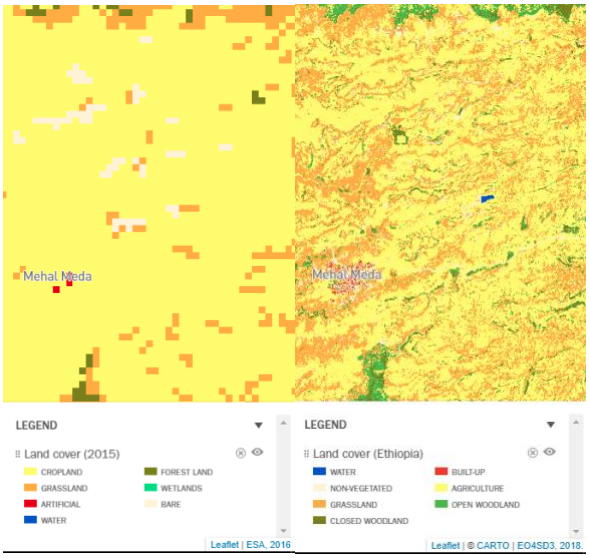

Figure 1: Demonstrating spatial resolution an example of an aggregated land cover from ESA-CCI (300m) (left) and customized land cover product (10m) derived from remote sensing analysis (right).

How often do we need an update?

Temporal resolution – the temporal resolution is the number of times a product is collected (e.g. daily, every 16 days, monthly, annually).

For which time period do we need data?

Temporal coverage – archived datasets allow us to see historical changes on earth, for example, in land cover or primary productivity using remote sensing. This can fill gaps in data that was not collected in the field in the past.

Best Practices for integrating remote sensing into your analysis

What is the budget?

Cost-effective – Satellite earth observation is very cost-effective as compared to field data collection. There are numerous remote sensing derived products that are freely available Examples of these include:

Theme	Description	Cost range	Time frame
Development of monitoring tools	• Refining list of indicators that will be applied to monitor this project. • Appraisal of the project area to assess available data, contexts, and other relevant baseline information. • Developing a schedule for implementation for the project time frame	$USD 20,000-25,000	12 days
Sampling framework	• Adapting Vital Signs socioeconomic and biophysical sampling tools, Resilience Atlas and Trends.Earth that capture project area food security indicators • Designing new representative sampling frame for the project area. • Develop sampling procedures to operationalize the framework prepared	$USD 19,000-26,000	10 days
Capacity building on use of tools	• Development of custom tools for reporting • Training on application of the Resilience Atlas and Trends.Earth.	$USD 40,000-85,000	30 days
Custom remote sensing analysis	• Development of custom products for project baseline and monitoring (e.g. land cover, land productivity trends, biomass production etc.) • Appraisal of the project indicators and translation into remote sensing products • Delivery of satellite earth observation services (e.g., irrigation planner, deforestation monitor)	$USD 10,000-50,000	30-60 days
Validation	• Refine sampling framework and datasets collection for validation • Collecting field samples • Integrate field samples with satellite earth observation data • Desktop validation	$USD 25,000-50,000 (including the field sampling)	6 months

Implications and Recommendations

Products derived from remote sensing can help to inform policy through sound science and can add value to existing information collected in the field. These data are scalable and can paint a picture on historical conditions. Customized analyses and validated datasets further advance the accuracy of the knowledge of biophysical variables of the environment. Combined with socio-economic data, earth observation informs decision makers where interventions can be prioritized to improve food security at the appropriate scale.

Next steps

If your project area for the GEF-Integrated Approach Programme for Food Security work could benefit from the use of customized remote sensing analyses, ground truthing/validation of datasets, interpretation of outputs or capacity development on the use of tools, please contact the HUB collaborative team at Rodrigo Ciannella <R.Ciannella@cgiar.org> and copy the general PCU email for the GEF-IAP-FS Project <GEFIAPFS.PCU@cgiar.org>.