APPLICATION OF GEOSPATIAL TECHNOLOGIES FOR AGRICULTURAL RESOURCES MONITORING AND MANAGEMENT IN RWANDA

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Abstract

In the dry seasons the Rwandan agriculture strongly relies on the water stored in artificial reservoirs of various sizes for irrigation purposes. However the success of any irrigation scheme strongly depends on the available water for irrigation stored in the reservoirs. Using the ESA products Sentinel 1 and WOIS, we mapped and monitored the variation of the surface area of eight reservoirs in Rwanda. Results show high variability in surface areas of the reservoirs over years and along the seasons.

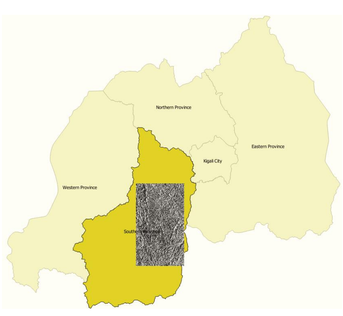
Introduction

Agriculture is the main stain of Rwandan economy. The Government of Rwanda is seeking to rationally exploit its soil and water resources as a mechanism to transform and modernize agriculture (MINAGRI, 2010). Application of EO is essential for climate change adaptation, to plan appropriate water harvesting, storage capacities and proper management of irrigation systems.

Objective

The main objective of this study was to monitor the change in the surface area of the reservoirs, estimate the volume of water available for irrigation and to combine this information with soil property map products to support the decision making for sustainable irrigation water management in the Southern province of Rwanda.

Case Study



Materials and Methods

The study was conducted in the Southern province of Rwanda for eight reservoirs being used to irrigate rice crop. To monitor the surface area of the reservoirs and for volume estimation a series of Sentinel-1 (product type: GRD, acquisition mode: IW, polarizations HH and VH) datas were obtained covering the study area from 2014 to 2017. VV Datas were first preprocessed in SNAP and to map the extent of water bodies, the Radar-Based Water Body Mapping product group of the Water Observation and Information System (WOIS) was used (Guzinski et al., 2014).

Fig. 1. The study area in the Southern province, Rwanda.

Results

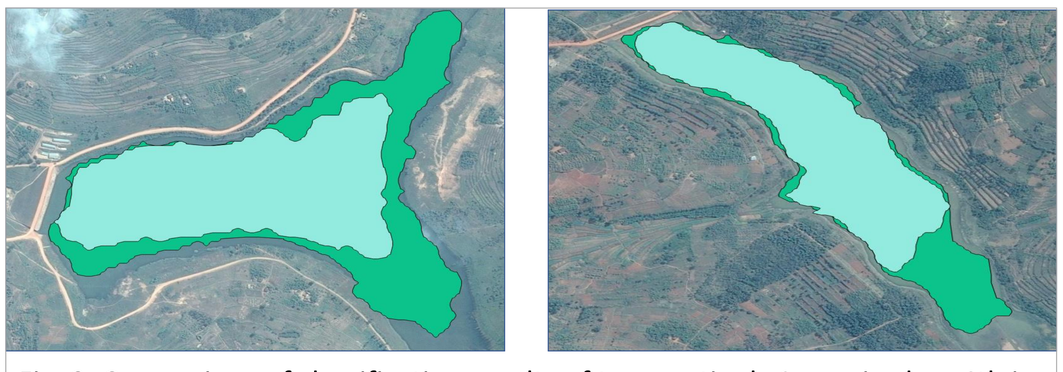
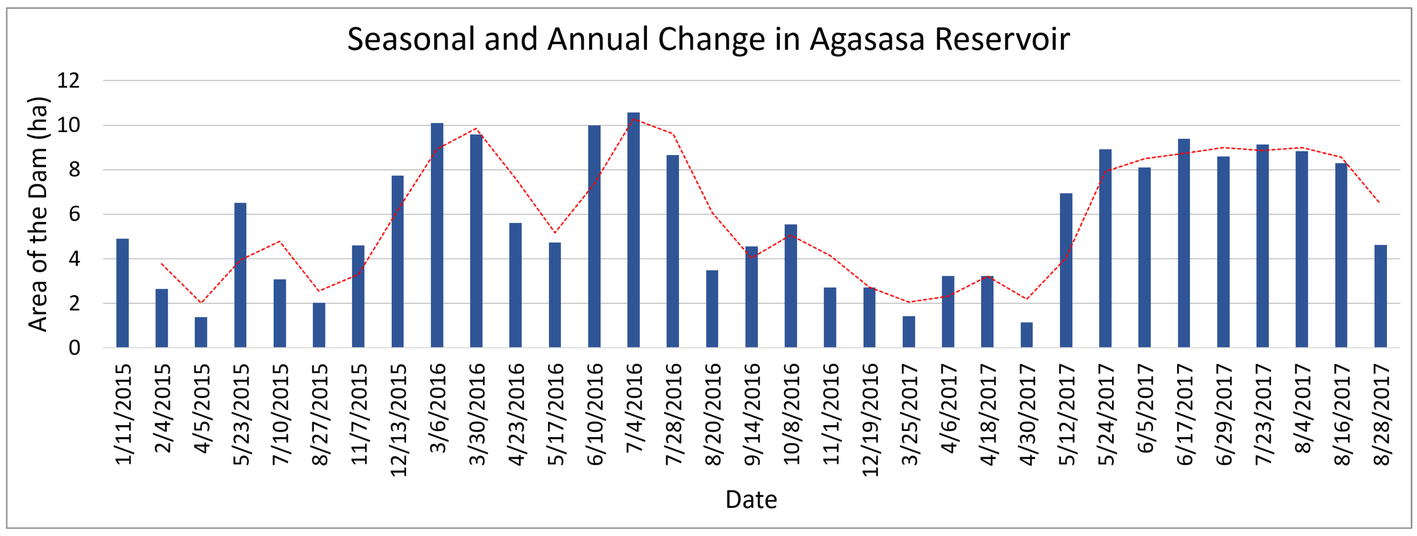
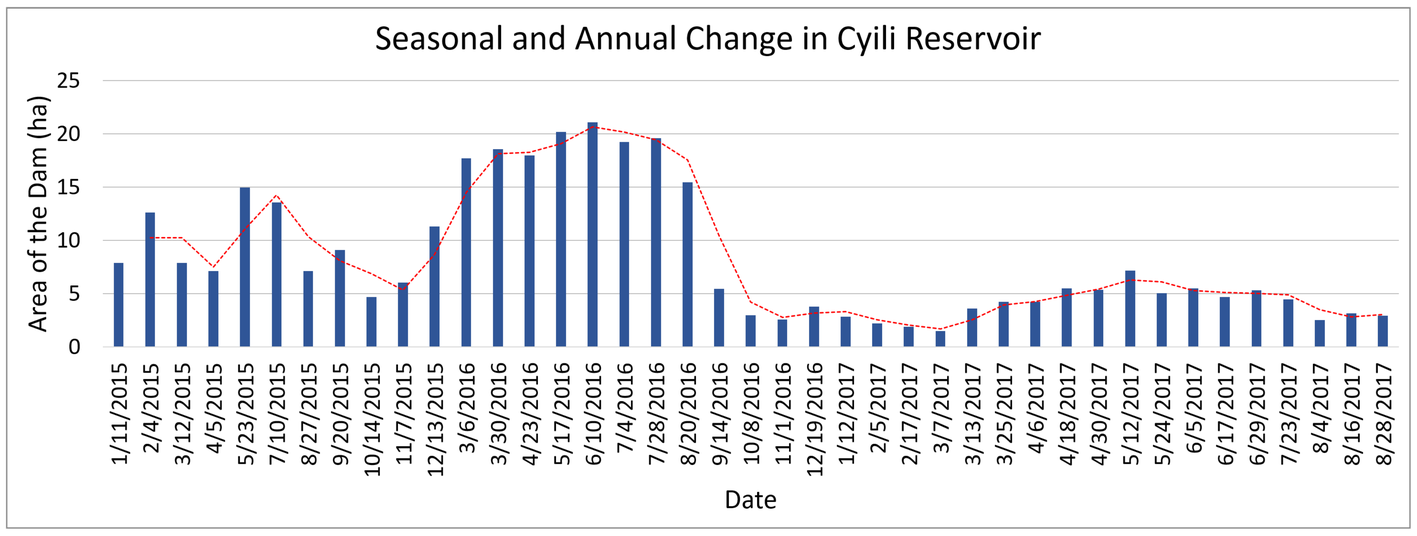
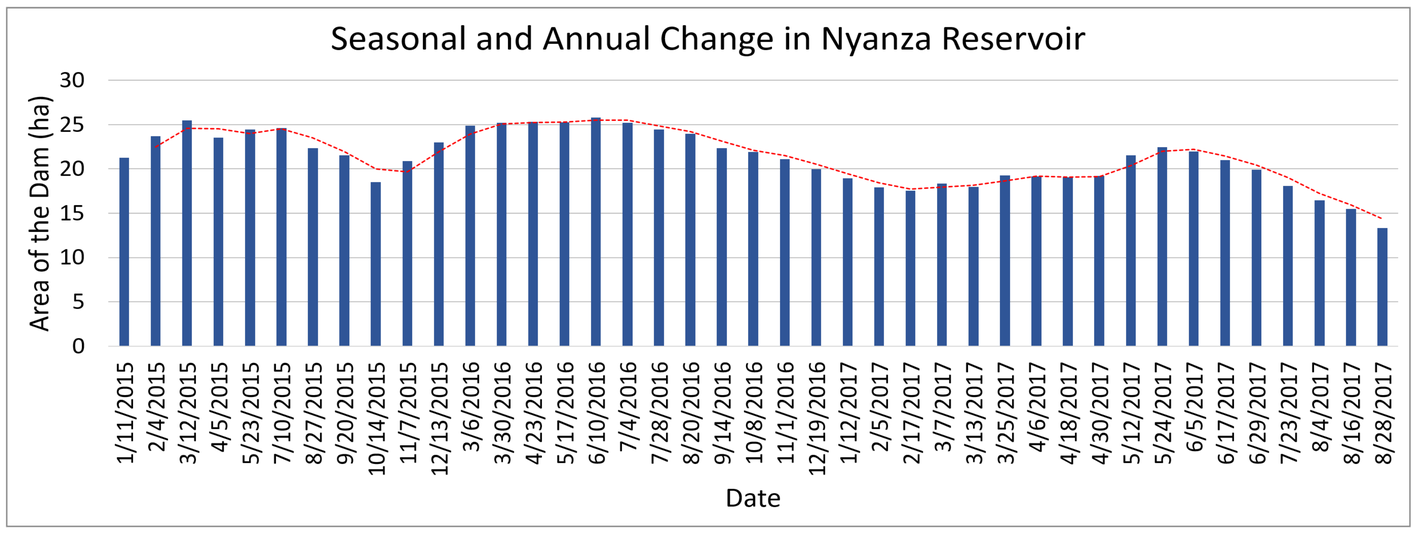


Fig. 2. Comparison of classification results of two sentinels 1 acquired on 4th in Green and 28th Blue sky August 2017 for Nyanza (left) and Mwogo (right) reservoirs.







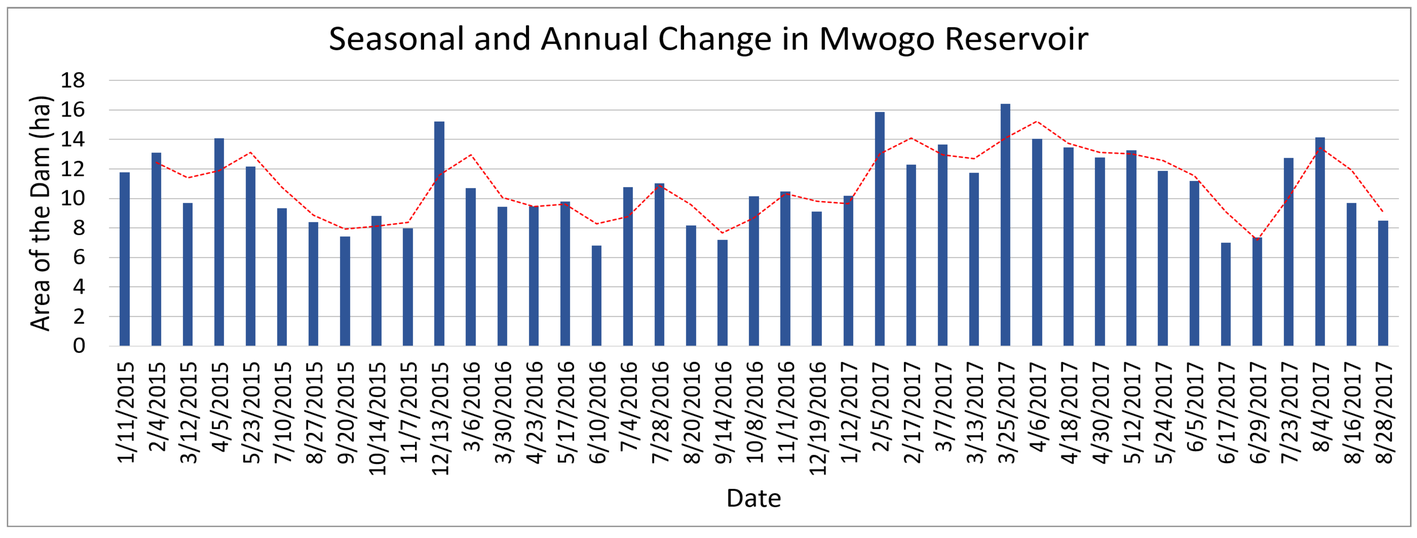


Fig. 3. Variation in the sureface areas of observed reservoirs in the Southern Province of Rwanda from January 2015 to August 2017

Discussion

The results from the water body mapping show that there have been agreat variation in the surface areas across all reservoirs. A decrease in the surface area was observed in summer specifically in the long dry season (August, 2017). Field datas (not presented) show that some variations may not be detected remotely immediately depending on the depth of the reservoir. In this case bathymetric measurements will be combined by satellite data for water volume estimates.

References

Guzinski et al. (2014): Enabling the Use of Earth Observation Data for Integrated Water Resource Management in Africa with the Water Observation and Information System

MINAGRI(2010): Rwanda Irrigation Master Plan. The Ministry of Agriculture and Animal Husbandry