1. Site description & Project Objectives

STUDY AREA

- Crop Types: Millet, Groundnut, Peanut
- Location: 15° 35’11’’S, 16° 39’33’’E
- Field boundaries: After the study of the village, near Bambey in the Kandji area, near the village of Diourbel
- Topography: Flat
- Weather: Tropical, rainy season
- Rainfall: 1000 mm
- Soil: Ferruginous (15%)
- Field size: 4.5 ha
- Growing season: October – May
- Plantation: 8 months
- Cicada: 5 (flying)
- Clouds: 10%
- Orthorectification: Data set n°1
- Data set n°2: One PLEIADES image and six LANDSAT images, as above, the same classification parameters were applied
- Data set n°3: One PLEIADES image and five LANDSAT images, as above, the same classification parameters were applied
- Data set n°4: One PLEIADES image and four LANDSAT images, as above, the same classification parameters were applied
- Data set n°5: One PLEIADES image and three LANDSAT images, as above, the same classification parameters were applied
- Data set n°6: One PLEIADES image and two LANDSAT images, as above, the same classification parameters were applied
- Data set n°7: One PLEIADES image and one LANDSAT image, as above, the same classification parameters were applied
- Data set n°8: One PLEIADES image and no LANDSAT image, as above, the same classification parameters were applied

2. Methods

Step 1: Pre-processing data

Satellite image data correction
- TDA radiance processing
- Orthorectification
- Cloud masking
- Tree and house masking using Touni algorithm (Touni et al., 2008) on VHRS PLEIADES NIR and panchromatic bands

Field data preparation
- Field data importation in a GIS software
- Field and trees boundaries digitalization
- GIS field data base construction

Step 2: Attribute selection

Spectral analysis

Radiometric and textural properties selection

Step 3: Image classification

Random forest classification
- Segmentation of the whole study area based on VHRS PLEIADES imagery
- Extraction of the optimal volume of variables per feature
- Classifications were performed on the data sets n° 1, n° 2 and n° 3 using a random forest algorithm

Validation
- Classification accuracy was evaluated using 50% of the ground truth data not used in the classification process
- The quality of the classification was measured through the overall accuracy coefficient and the Kappa

3. Results

Data set n°3, composed of one PLEIADES image and 6 LANDSAT-4 images, gives the best result for image classification and permits to obtain a detailed land use map of Bambey study area (12 land use classes).

4. Conclusions and Perspectives

Conclusions
- The study shows that one PLEIADES image acquisition during the growing period is not enough to identify the main crop types in Bambey area. Indeed, the sub-meter spatial resolution of PLEIADES allows to underline the field boundaries, but the four spectral bands do not permit to identify the field content.
- The joint use of the PLEIADES image and a Landsat-8 time series improved considerably the land use map, in particular the crop type identification, even if there is no image acquisition during two consecutive months, at the peak of the rainy season.

Perspectives
- Reinforced by the results obtained in this study, we believe that the use of multi-source images (optical and microwave) will improve the crop type identification. In particular, we have high expectations on the joint use of Sentinel1 and Sentinel2 image time series, that will be tested in 2016-2017.

Bambey (Sénégal)

JECAM/GOEGLAM Science Meeting, Kiev, 11-12 October, 2016
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