

Forest plantation mapping in the Southern Highlands

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Introduction

Southern Highlands is an important wood production area in Tanzania for its preferable climate conditions and long history of forestry activity holding high potential for growth of forestry sector (Nganga 2011). However, spatial and qualitative information on the tree plantations is not consistent as there are no maps about the existing plantations nor information on tree species, woodlot ages or densities. This information would be essential for effective decision-making of the forestry sector operators and its beneficiaries for site-selection of on-going plantation development and possible harvesting operations. Therefore, spatially explicit, accurate, scalable and repeatable forest resource assessment is needed to base future projections, land management plans, regional market potential and also livelihood strategies on reliable data. In this study we showcase the opportunities that recent development of online data catalogues and computing capacity together with structured participatory mapping have created to provide regionally adjustable forest resource assessment.

Materials and methods

- The plantation mapping process was based on open source software and freely available satellite data.
- Mapping was conducted in two stages (Figure 1):
In the first stage tentative plantation mask was created based on reference data collected from Google Earth
In the second stage spatial accuracy and qualitative information was supplemented with high volume of reference data collected by local experts
- Collected training data is used to test various classification methods and input data sets (optical and radar satellite images of different resolutions and seasons along with digital elevation model, see text box in Figure 1)
- A plantation map in 30m resolution will be produced for the study area.

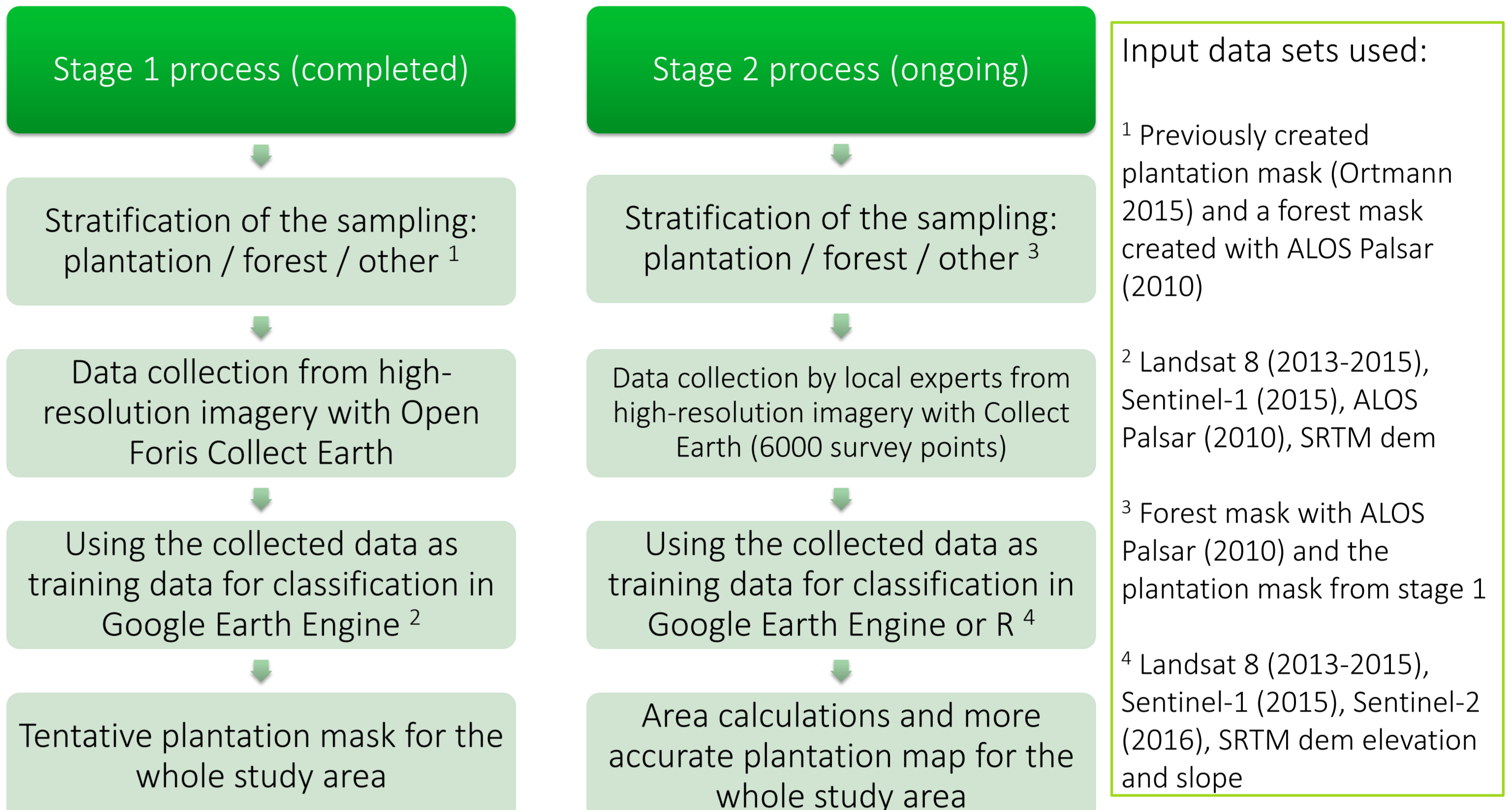
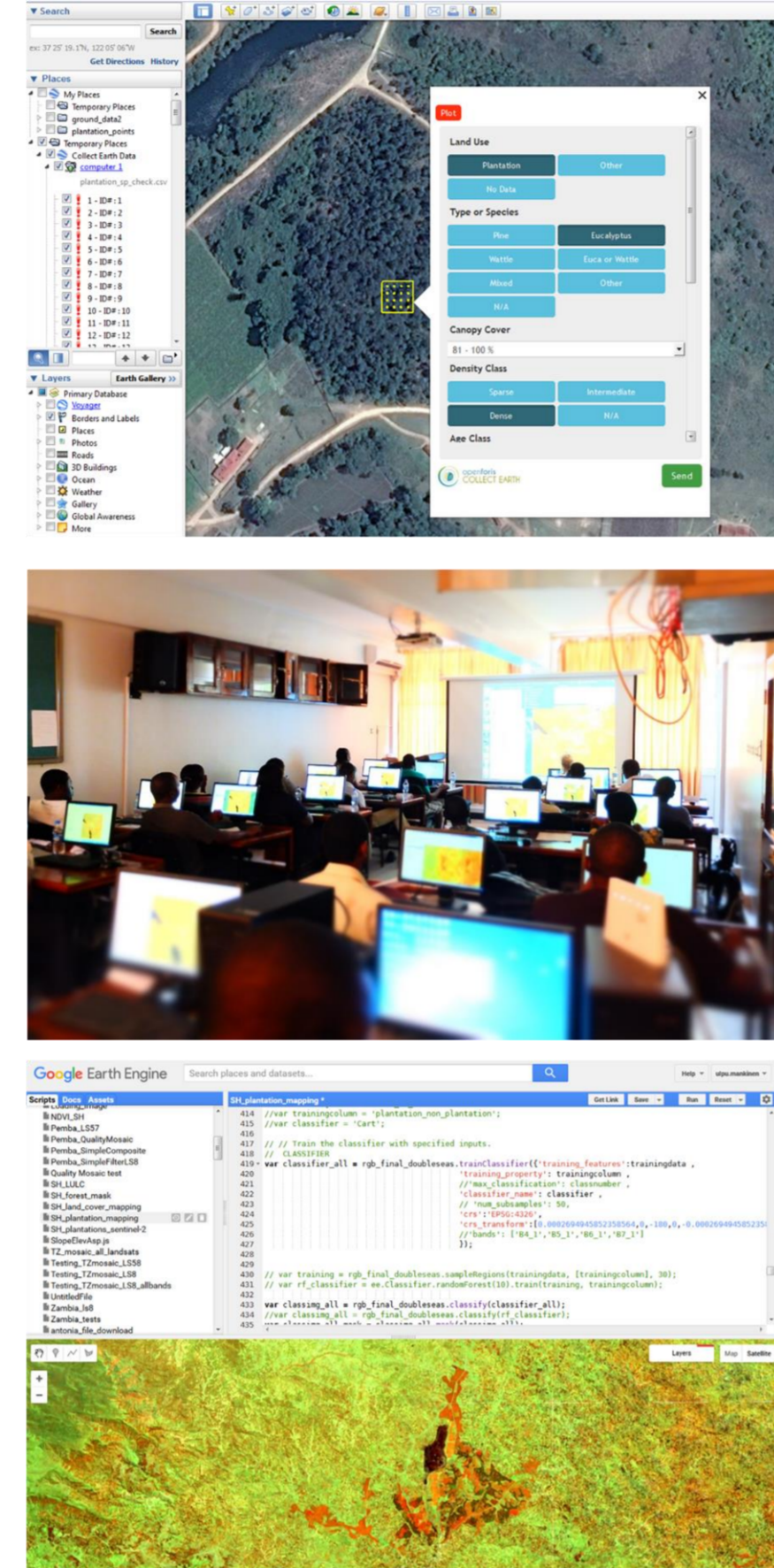


Figure 1. Mapping process and input data sets for each stage



Preliminary results – work in progress

- Preliminary classification results show that majority of the plantation area is located outside the largest government and company-owned plantations, indicating a significant potential of private woodlots.
- Based on the preliminary plantation map, pine is the dominant planted tree species with 67%, and the share of eucalyptus and wattle combined is 33%.
- The challenges of the mapping are to distinguish the young and the small woodlots, and to differentiate plantations from natural forests especially in shaded slopes, as these classes have very similar pixel values.

Next steps

The next step in the mapping is to test the image classification with different classifiers and input data set combinations in different open source platforms (Google Earth Engine, Open Foris Geospatial Toolkit and R). A validation data set will be collected from the field and using Open Foris Collect Earth tool to assess the accuracy of the results and provide a better estimate of hectares planted. More detailed results will be provided for three pilot areas within the Southern Highlands where a denser sample has been collected, and where cloud-free high-resolution Sentinel-2 satellite data (pixel size 10x10m) is available.

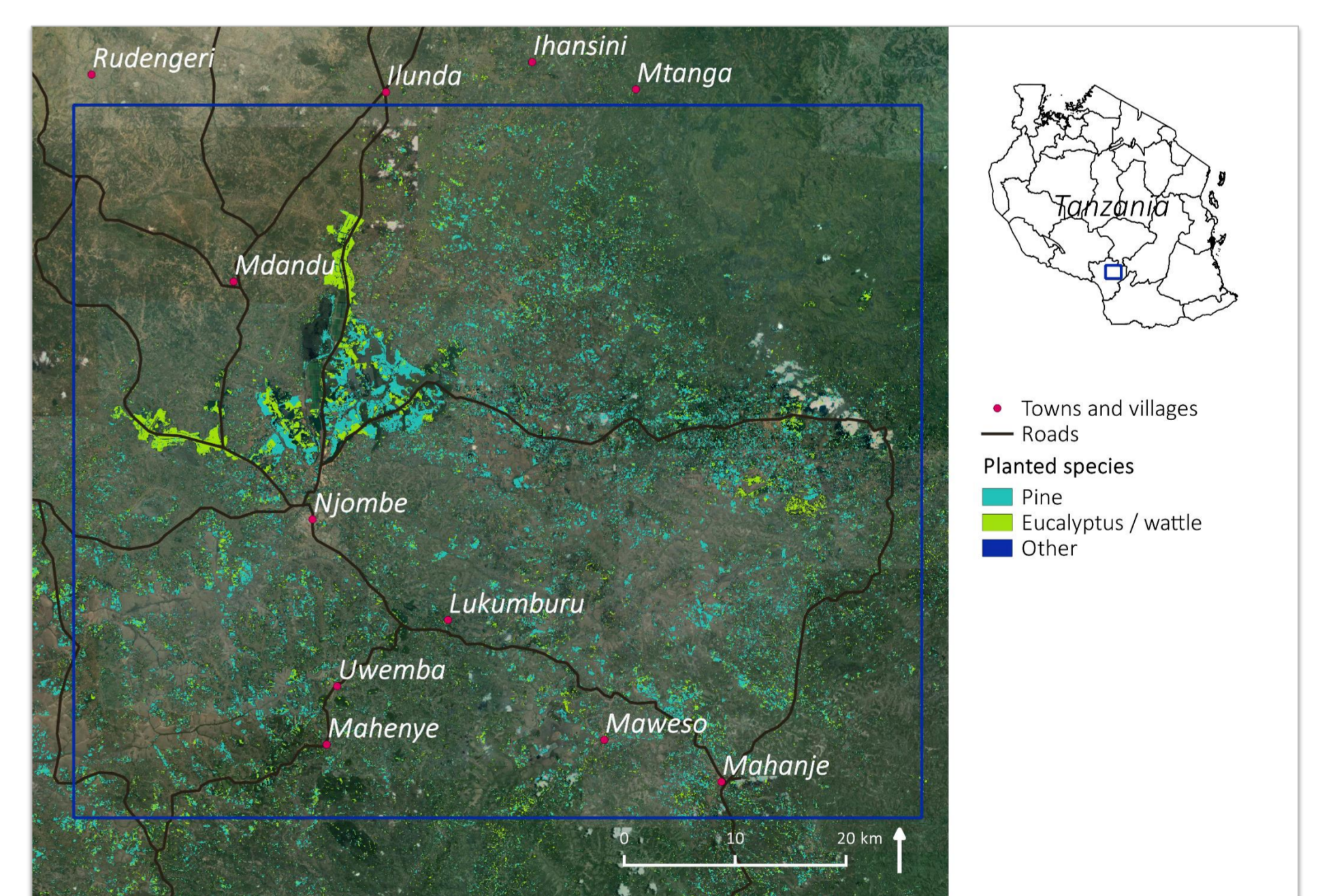


Figure 2. An example from Njombe of the planted tree species map created in Google Earth Engine. Google Earth high-resolution satellite image in background (©TerraMetrics 2016).

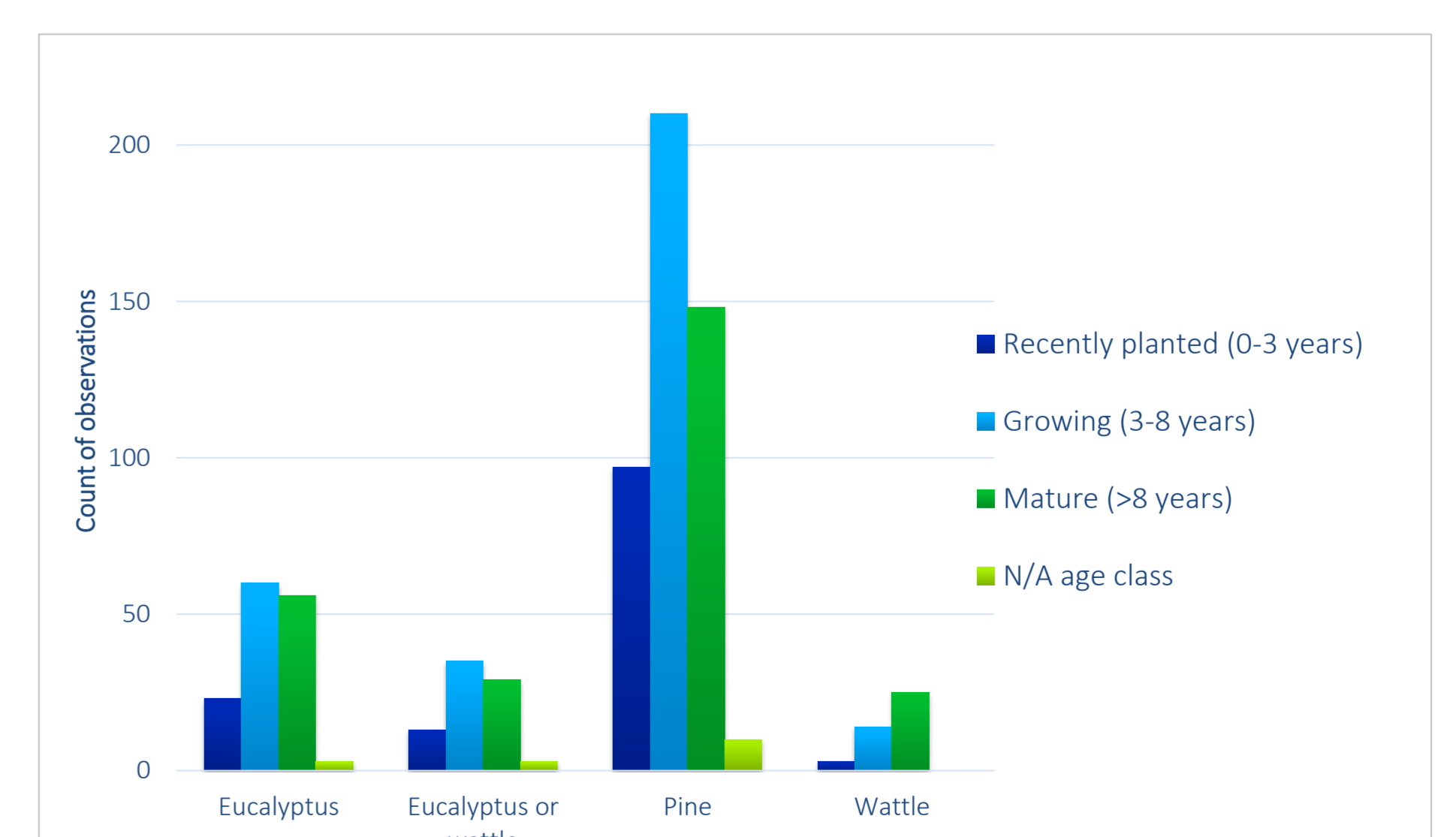


Figure 3. Age class distribution of the plantation observations collected in Mapathon event with Open Foris Collect Earth.

References

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 Open Foris Initiative of the Food and Agriculture Organization of the United Nations (www.openforis.org)

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