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Carbon, Biomass, Timber volume data

The Project on Capacity Development for Sustainable Forest Resource Management in Solomon Islands

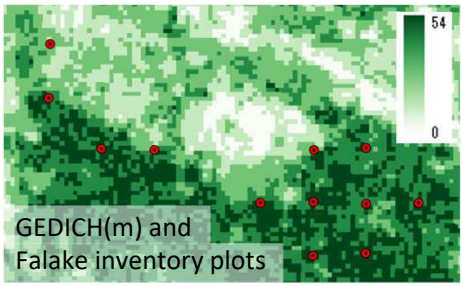
【Overview】

Solomon Islands depends very much on the forest. By far forest becomes one of the biggest income generators for the country. Moreover, most people equally rely on forests for their livelihood. However, people's dependence and inadequate forest governance have caused deforestation to a level that is not sustainable. Commercial logging operations, for instance, have been one of the major causes of deforestation. And as the population increases, it also demands more forest resources consumption as well. Therefore, the data of current carbon, biomass. timber volume is essential for the sustainable use of forest resources. The data set is estimated using satellite lidar data (Global Ecosystem Dynamics Investigation(GEDI) https://gedi.umd.edu/) and inventory data on the pilot sites: Komuniboli and Falake. The data set covers the entire Solomon Islands and is uploaded to SolGeo-FIMS. In this fact sheet, the detail of this data set is explained.

【 Method 】

Step1 Preparation GEDI Global Forest Canopy Height data and inventory data

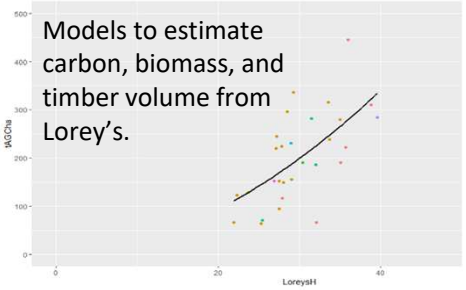
GEDI Global Forest Canopy Height data (GEDICH) is downloaded from https://glad.umd.edu/dataset/gedi. The data was developed through the integration of the GEDI Lidar data and Landsat analysis-ready data time-series. The spatial resolution is 30m. The inventory survey was conducted on the pilot site: Komuniboli and Falake. There are 29 plots in total. (Komuniboli:17,Falake:12). Both data were acquired in 2019.



GEDICH(m) and Falake inventory plots

Step2 Developing carbon, biomass, and timber volume estimation models based on GEDICH

The models to estimate Above and Below Ground Carbon (Carbon), Above and Below Ground Biomass (Biomass), and Timber Volume (Volume) from GEDICH were developed compared with the overstory height of plots. Lorey's height method was used to estimate the height of plots. The height had a good correlation with GEDICH. We used the exponential function to build the models.


Models to estimate carbon, biomass, and timber volume from Lorey's.

Step3 Mapping carbon, biomass, and timber volume based on GEDICH

The models developed at Step2 were applied to map Carbon, Biomass, and Volume of Solomon Islands. Their spatial resolution was 30m. Carbon, Biomass, and Volume per pixel were calculated. At last, these maps are summarized by FMU.

[Result]

Models

Three models to estimate Carbon, Biomass, and Volume were shown in the Fig. 1. These models explains about 40% variance of inventory plot data even though the curves looked to fit well. That is due to the limited plot data. Low (less than 20m) overstory plots were not included in the plot data. The correlation between GEDICH and Lorey's Height was 0.98 when we assumed the line passed through the origin.

Maps

Carbon, Biomass, and Volume maps are shown in Fig. 2. The carbon stock, biomass stock, and volume in Solomon Islands are 579mn, 1232mn, 525mn respectively according to the result. Province based results are shown in Table1.

Table. 1 The result of Carbon, Biomass, and Volume

Province	Volume(m3)	Biomass(t)	Carbon(t)
Central	9,727,811	22,223,777	10,440,410
Choiseul	71,849,868	171,814,714	80,716,074
Guadalcanal	104,076,288	247,356,251	116,204,399
Isabel	84,849,074	200,322,934	94,108,825
Makira	59,775,095	138,729,021	65,172,893
Malaita	70,138,073	161,855,284	76,037,277
Rennell and Bellona	11,227,194	25,294,625	11,883,050
Temotu	9,514,684	19,926,679	9,361,266
Western	104,311,249	244,179,313	114,711,919
Total	525,469,338	1,231,702,598	578,636,113

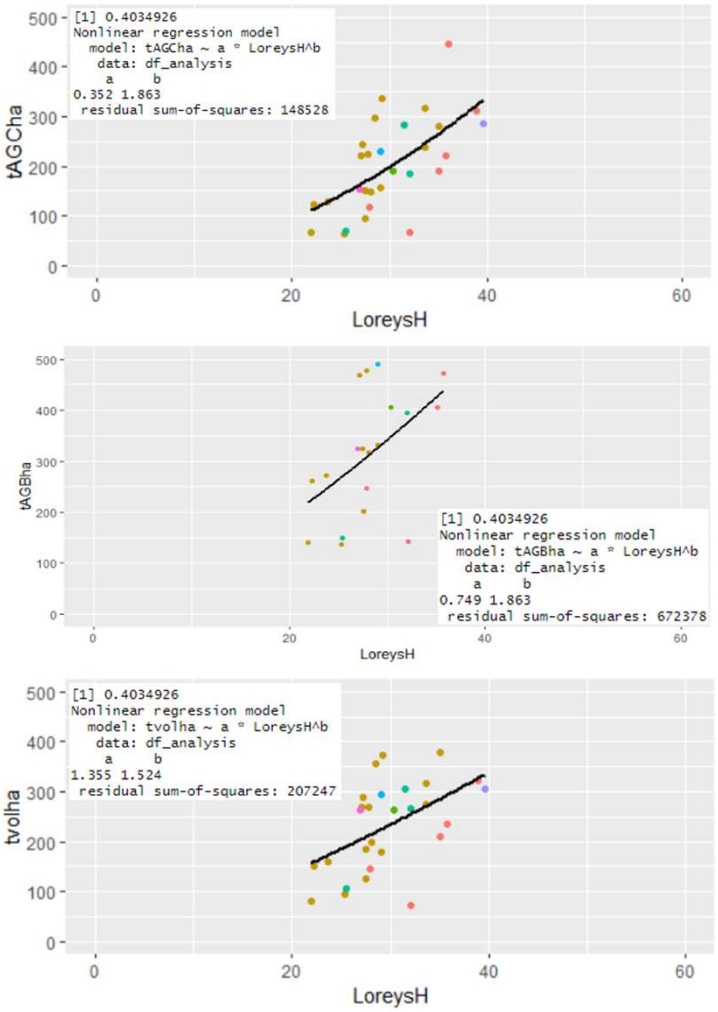


Fig. 1 The developed models to estimate Carbon, Biomass, and Volume from Lorey's Height

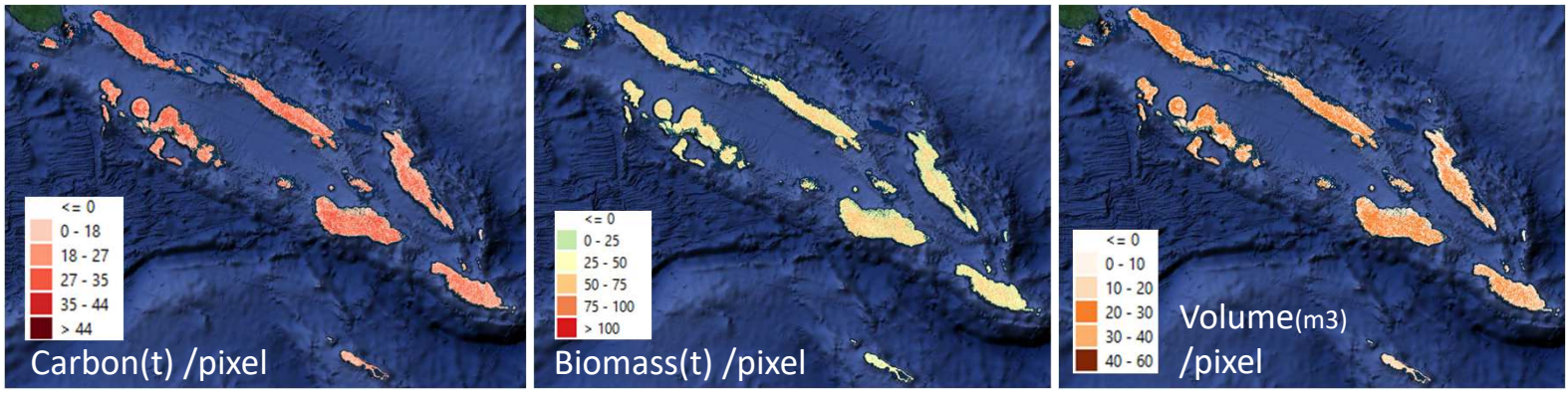


Fig. 2 The maps of carbon, biomass, and timber volume

[Discussion and limitation]

We used the inventory data on two of the pilot sites to build the models. Therefore, the sample is considered biased concerning forest type. And due to the lack of lower over story plots in the inventory data, the developed models still have spaces to improve their accuracy. You need to keep this in mind when interpreting them. However, such essential forest information was missing for Solomon Islands' forest management. Therefore, **the information can be good references to discuss the sustainable use of forest resources with communities, logging companies, etc., especially for the distribution of the resources**. The dataset has been uploaded on SolGeo-FIMS. You can access and check them easily on it. You can use the raster dataset to know the distribution of Carbon, Biomass, and Volume. Summarized information by FMU contributes to making forest management works efficient and effective. The improvement of the sample is required for the next step.

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