JAMES RENNIE BEQUEST

REPORT ON EXPEDITION/PROJECT/CONFERENCE

Expedition/Project/ Conference Title: Assessing the carbon stocks of an agricultural frontier in the Peruvian Amazon

Travel Dates: 26th July 2013 – 25th August 2013

Location: Iquitos, Peru

Group member(s): Leah Farquharson

Aims: To assess the accuracy of fine resolution remote sensing imagery for use in estimation of forest carbon stocks through field data collection.

OUTCOME (not less than 300 words):-

Introduction

Mitigation of climate change through the implementation of the Reduced Emissions from Deforestation and Degradation (REDD) initiative within tropical regions of South America depends entirely on the mapping and monitoring of the carbon dynamics of the forest stand. It is known that deforestation and degradation account for 10-15% of global CO_2 emissions (IPCC, 2007) with further deforestation expected due to the current timber extraction, farming and road building in the Peruvian Amazon (Angelsen, 2008). In order for the REDD programme to be implemented effectively there needs to be a suitable method of accurately deducing the carbon stocks as is expected by investors and monitoring agencies. However, traditional based field methods of carbon assessment are proving to be impractical due to the extent of forest that requires mapping and the associated high costs..

The objective of my study was to assess whether hyperspatial remote sensing data is an accurate method of estimating biomass of a complex tropical environment in the Peruvian Amazon.

The study will initially assess whether remote sensing data can evaluate canopy cover within this environment and to what accuracy.

Hypothesis 1 - Hyperspatial remote sensing data can accurately estimate the canopy cover of an agricultural frontier at differing stages of regrowth in the Peruvian Amazon

This will be conducted by comparing the canopy cover percentages extracted from the remote sensing images with field data.

If it is possible to assess canopy cover through remote sensing data investigation of a relationship between canopy cover and biomass within this environment will be undertaken.

H_2 - Biomass is indirectly related to canopy cover within this environment.

Biomass inventories of the area were carried out and a regression analyses will be conducted with this data and the canopy cover values collected in the field.

If both hypotheses are accepted it will be possible to estimate biomass directly from remote sensing analysis and assess the carbon dynamics of the landscape from 2002-2010 as I have access to IKONOS images from both of these dates.

Field Visit

I spent three weeks in the small, remote town of Iquitos in Peru during the summer of 2013. I assisted the UK based charity Plant Your Future (PyF) conducting a biomass inventory in agricultural fallows on land owned by the farmers that are part of the PyF scheme. PyF work with local farmers on the implementation of sustainable agroforestry systems that do not require vast expanse of rainforest to be removed, a downfall of current practices. The PyF team and myself would leave the town early and travel by car towards the fallows which ranged between a distance of 30 – 80km up the only highway in the area (It is only possible to reach Iquitos by plane or boat as no roads have been constructed to reach the town due to the dense forest) to the neighbouring town of Nauta.

Once we had reached the sites we would mark a $35m^2$ plot and measure the diameter of all the trees at a height of 1.3m within the boundaries of the plot. Alongside that we would note the species of each tree and the landcover type (agricultural land, secondary forest, primary forest, plantation) and take a series of photos of the area.

In order to measure the canopy cover of the plots I would take photographs of the canopy from underneath using a fisheye lens which has a 180̊ field of view. Figure one is an example of the image that the lens produces. Once back in Edinburgh the photos were analysed using the software Gap Light Analyser which calculates each pixel of the photo as either open sky or leaf are as shown in figure 2.

Figure 1. Hemispherical photo of a plot of secondary forest in the community of Palo Seco.

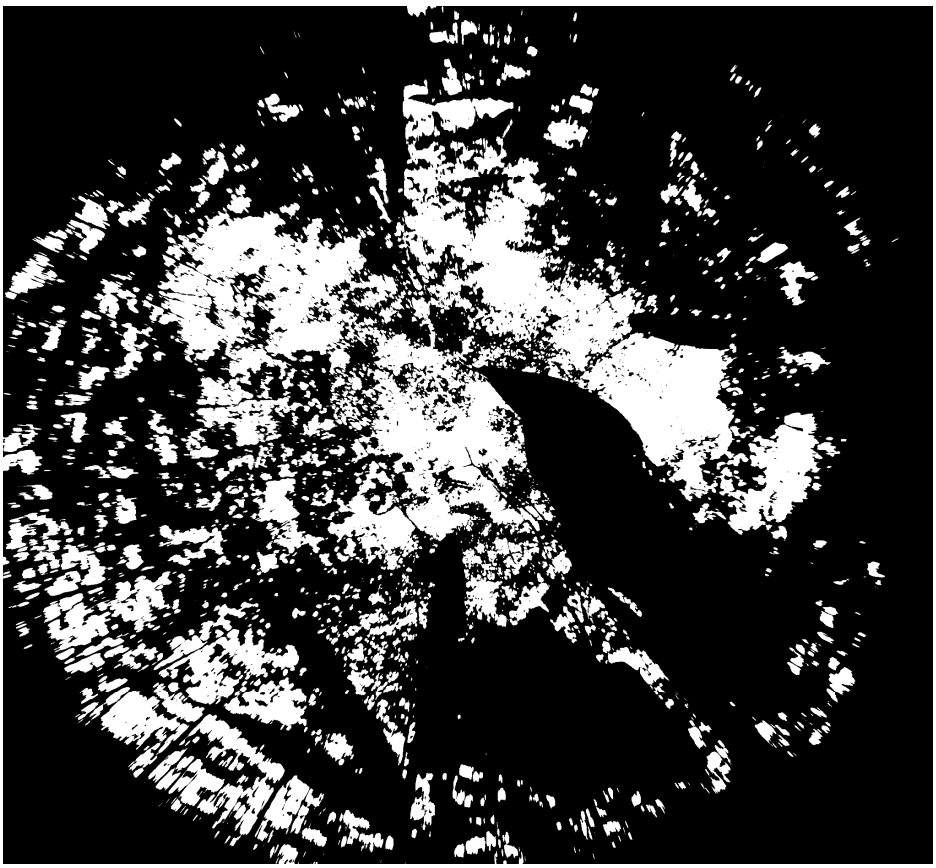

Figure 2. Same hemispherical image as figure 1 that has been processed using Gap Light Analyser. The black area is leaf and the white area is open sky. The canopy cover percentage of this image 42%.

During the field work I visited 16 plots over the 3 weeks and had an exceptional time. I had always dreamed of visiting the Amazon Rainforest and the beauty of area exceeded my expectations. Through this project I have grown a greater appreciation of the social barriers and implications of conservation strategies and the need to incorporate local communities in these projects. It is imperative projects focus on providing sustainable incomes for indigenous groups who otherwise rely on over extraction of the natural resources in the area and unmaintainable farming practices.

I am still currently analysing the satellite imagery using the GIS software ENVI in order to assess the change in carbon stocks of the area from 2002-2010. I have never carried out remote sensing analysis before however I now realise the full potential of this method in assessment of large areas of land and plan to continue study in this area. Having the chance to do this project has sparked an interest in working with REDD projects that I previously was unaware of and I hope to continue my career in this line of work.

I would just like to take the time to thank the Rennie Bequest Fund for making this experience possible for me and if anyone is interested in my research and would like to know anything further please do not hesitate to contact me at s0819911@sms.ed.ac.uk.

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Additional Photographs

A lake in the middle of a farmers agricultural land in 13 de Febrero.

Stopping for lunch after a biomass inventory

The Amazon Rainforest

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