A valuation comparison of peatlands and palm oil in Malaysia

Cora Coleman, Comp Sci. Sophomore, New College of Florida

New College of Florida
THE HONORS COLLEGE

Abstract

Malaysia accounts for 44% of the globe's palm oil exports, second to Indonesia. Similarly notable are the long-standing issues of land conflicts and the opaque and unclear land tenure laws. In addition to GIS data, I use ecological economics and operational statistics to quantify values that are then projected and compared within the final map.

Introduction

Palm oil is a versatile, high-yield vegetable oil that is widely used in consumer products. Today it is the most consumed edible oil. Palm oil is cheap and in high demand, encouraging places that produce it, like Southeastern Asia (especially Borneo and Sumatra), to continue to expand plantations at the expense of the rainforest, its inhabitants, and already-established communities of native peoples. Using GIS techniques, I evaluated the differences in the yearly monetary yield per hectare of palm oil and palm kernel in Malaysia against the yearly monetary yield per hectare of Malaysia's natural ecosystem services provided by the original environments of peat swamps, upon which palm oil plantations are currently encroaching. I focused in particular on the state of Sarawak, where peat swamps line the coast. I predict that the oil palm concessions that are located on peat swamps will yield a negative profit due to the higher valuation of the peat

Figure 1. Sarawak study
The state is layered with a peatlands raster dataset, a palm oil raster dataset, and a WDPA polygon shape file.
(Cora Coleman 2015)

Methods

I acquired the data from the Global Forest Watch website by downloading the shape files for oil palm concessions in Sarawak and for WDPA conservation areas in Malaysia. I also downloaded a raster dataset of peatlands in Malaysia and Indonesia from the same source. I then changed the two shape file projections using the Project tool located in the Data Management toolbox. I then transformed the peatlands raster dataset into a polygon shape file using the Raster to Polygon tool located in the Conversion toolbox. For each of the oil palm concessions and peatlands polygon layers I added two fields to each attribute table, one used the Geometry tool to calculate the area in hectares (ha) per polygon. The other represented the respective annual value per hectare of each polygon, produced using the Field Calculator tool to multiply the area in hectares field with the annual value per hectare. After this, I used the Lasso Select tool to draw a boundary around the peatlands and conservation areas within Sarawak to select them and create new layers using those only within Sarawak. Then I converted the peatlands and oil palm concessions polygon layers into raster layers using the annual value per hectare as the value input in the Polygon to Raster tool located in the Conversion toolbox. Then I used the Map Algebra Raster Calculator in the Spatial Analysis toolbox to calculate a layer representing the profit of the peatlands raster and a layer representing the profit of the oil palm concessions raster. I did this by subtracting one layer from the other in the Raster Calculator.

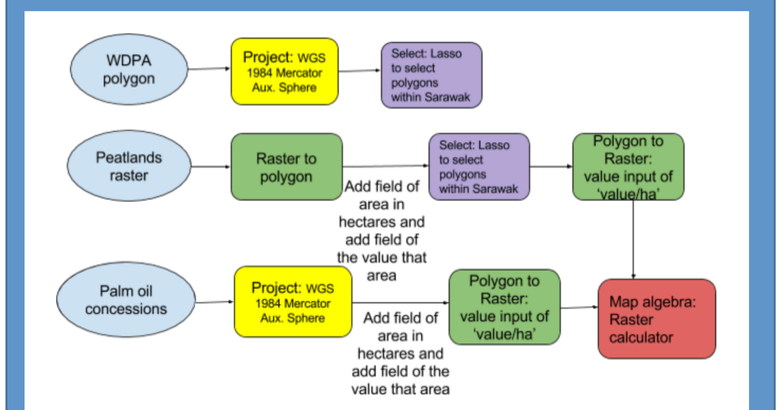

Figure 2. Flow chart of methodologies

Results

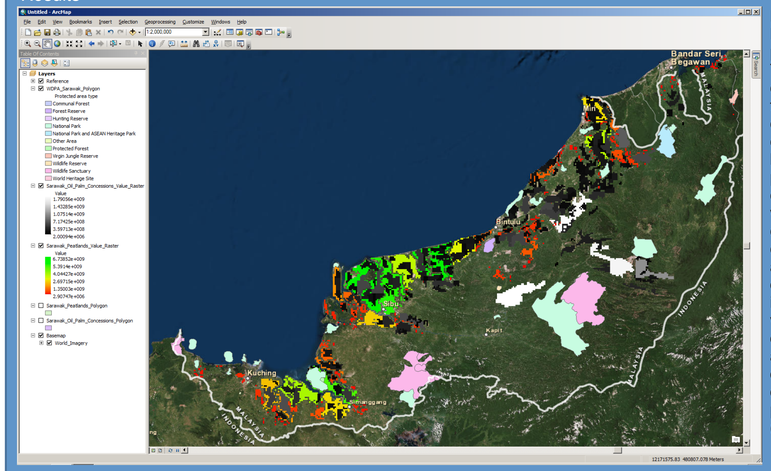

Figure 3. Palm oil and Palm kernel annual prices per ha rasters
The peatlands raster is colored in a range from red to green while the palm oil concessions raster is colored in a range from black to white. The WDPA polygons are included and colored in a pastel range visible in the table of contents. The palm oil concessions are layered atop the peatlands to better distinguish the differences in the values. The peatlands valuation far outweighs that of the palm oil concessions, and the lower-profiting palm oil concessions are distributed among the peatlands.
(Cora Coleman 2015)

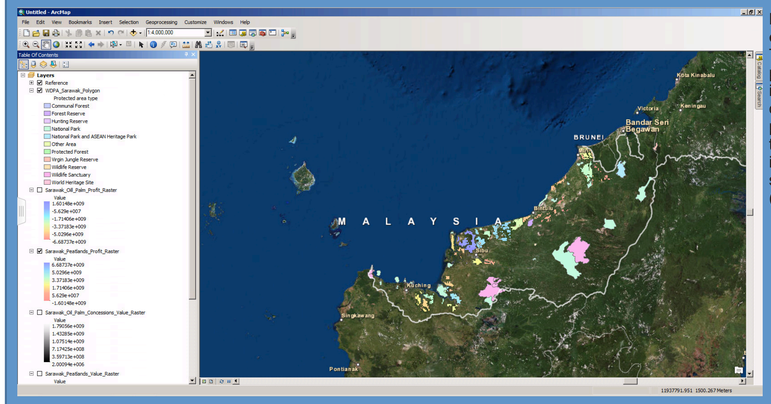

Figure 4. Annual profit of peatlands
The annual profit of the peatlands in the areas intersected by oil palm concessions. The profit is positive for a majority of the raster cells, as indicated by the color scale.
(Cora Coleman 2015)

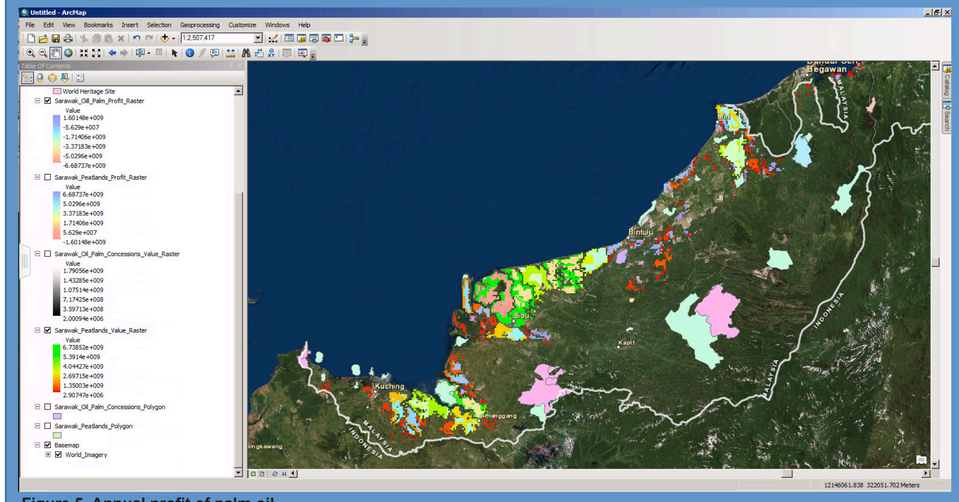

Figure 5. Annual profit of palm oil
As indicated by the color scale, the profit is negative for a majority of the palm oil concessions. This layer is included over the original peatlands valuation raster to illustrate the locations of the negative profit.
(Cora Coleman 2015)

Conclusion

In determining the annual valuation of an ecosystem, I refer to the paper "The value of the world's ecosystem services and natural capital" by Constanza et al. (1997). On page four of the paper, table two displays a summary of the average global values of annual ecosystem services. Many of the valuation techniques used in the studies covered in their synthesis are based, directly or indirectly, on attempts to estimate the 'willingness-to-pay' of individuals for ecosystem services. For the purposes of this case study, the biome values pulled from table two are from those biomes which exist in Malaysia. Wetlands, tidal marsh and mangroves, and swamps and floodplains are thematic to Malaysia's ecosystems. Summed up, these three biomes produce a total annual value per hectare of $44,355 according to Constanza et al. (1997).

To compare, in determining the annual valuation of a hectare of palm oil and a hectare of palm kernel, I refer to the operational statistics compiled by Sime Darby, a major plantation division within Malaysia. For the fiscal year 2013/2014, the total FFB (Fresh fruit bunch) yield per mature hectare was reported to be 22 tonnes. The average selling prices before sales tax in RM (one Malaysian ringgit equals 0.23 US dollars) per tonne were reported to be RM 2,509 for palm oil and RM 1,692 for palm kernel. Thus, to obtain the 2013-2014 valuation per hectare of palm oil, multiply 22 by 2,509 to yield RM 55,198, which converts to $12,934.68 US dollars. To obtain the 2013-2014 valuation per hectare of palm kernel, multiply 22 by 1,692 to yield RM 37,224, which converts to $8,722.78 US dollars.

The difference of annual value per hectare between the combined ecosystems and palm oil equals $31,420.32. The difference of annual value per hectare between the combined ecosystems and palm kernel is greater, equalling $35,632. However, individually the ecosystem service values compare differently. Wetlands, annually valued per hectare at $14,785 by Costanza et al. (1997), and swamps and floodplains, annually valued per hectare at $19,580 by Costanza et al. (1997), remain as the greater value when compared with either palm oil or palm kernel. However, tidal marsh and mangroves, annually valued per hectare at $9,990 by Costanza et al. (1997), remain as the greater value when compared with palm kernel but not when compared with palm oil.

Discussion

An interesting thought to further this project would be to identify the areas in Malaysia where palm oil requirements are met and not exceeded based off of the data for palm oil agricultural requirements in "A quick scan of peatlands in Malaysia" by Wetlands International (2010). Gauging further where the palm oil farms are located, it could be determined if there are areas where palm oil farming could take place sustainably, as described in "How to identify degraded land for sustainable palm oil in Indonesia" by Gingold et al. (2012). It is important to realize that the people of Malaysia benefit economically from the mass scale production of palm oil and that in participating in its cultivation, they are simply trying to survive. It is the large companies that capitalize the palm oil market that are truly the ones benefitting financially. This raises the question of whether an impoverished people are being exploited in their lack of native land claims and rights by wealthy companies. Large companies who then buy that unclaimed land to cultivate a fruit that cannot therein be grown sustainably, and thus is not truly for the

Acknowledgements

Global Forest Watch Commodities for the usage of their layers.

References

Print

1. Costanza, Robert, and Lisa Wainger, eds. Ecological Economics: The Science and Management of Sustainability. New York: Columbia UP, 1991. Print.
2. Wetlands International, comp. A Quick Scan of Peatlands in Malaysia. Petaling Jaya: Wetlands International, Malaysia, 2010. Print.

Web

1. Bateman et al. 2002. Applying geographical information systems (GIS) to environmental and resource economics. Environmental and Resource Economics (22): 219-269.
2. Costanza et al. 1997. The value of the world's ecosystem services and natural capital. Nature (387): 253-260.
3. Forest People's Program. 2008. Securing indigenous peoples' rights in conservation reviewing and promoting progress in Sabah, Malaysia. Working paper.
4. "Get Informed About Palm Oil." Get Informed About Palm Oil. University of Arizona, n.d. Web. 17 Nov. 2015.
5. Gingold et al. 2012. How to identify degraded land for sustainable palm oil in Indonesia. Working paper.
6. Norwana et al. 2011. The local impacts of oil palm expansion in Malaysia: an assessment based on a case study in Sabah State. Working paper.
7. "Sime Darby Annual Report 2014." Simedarby.com. N.p., 2014. Web. 26 Oct. 2015.