

OP-204 [Beekeeping for Rural Development]

Forest conservation through beekeeping: using satellite imagery to demonstrate the role of beekeeping in protecting natural forests

Chris Keywood

Bees for Development

Natural forests are known to be some of the most florally diverse landscapes on earth, providing exceptional habitats for bees and therefore are productive areas for beekeepers. They are also some of the most biodiverse areas, containing many of the world's unique fauna and flora. Around the world however, these habitats are shrinking. As human settlements expand into the forests and economic pressures push for deforestation, in order to create landscapes with greater income generating capacity, these forests are at risk of disappearing. One of the main activities causing this deforestation is the clearing of the forest landscapes to create traditional agricultural cropland. Beekeepers can play an important role in combatting this trend. By using the forests for their income generation there is less pressure on the beekeepers to clear the forested land and as they depend on the forests for their income, they are incentivised to prevent others from clearing the land as well. Using satellite imagery we are providing evidence that forests well used by beekeepers are less prone to deforestation than those where little to no beekeeping is taking place. Comparing on the ground studies with Sentinel satellite data and vegetation indices we are creating a collection of evidence to demonstrate the extent of beekeepers ability to preserve their habitats and livelihoods. This evidence can then be used to inform land use policy, assist with development programs and add additional value to the products supplied by these forest beekeepers, allowing them to reach new markets and generate more income.

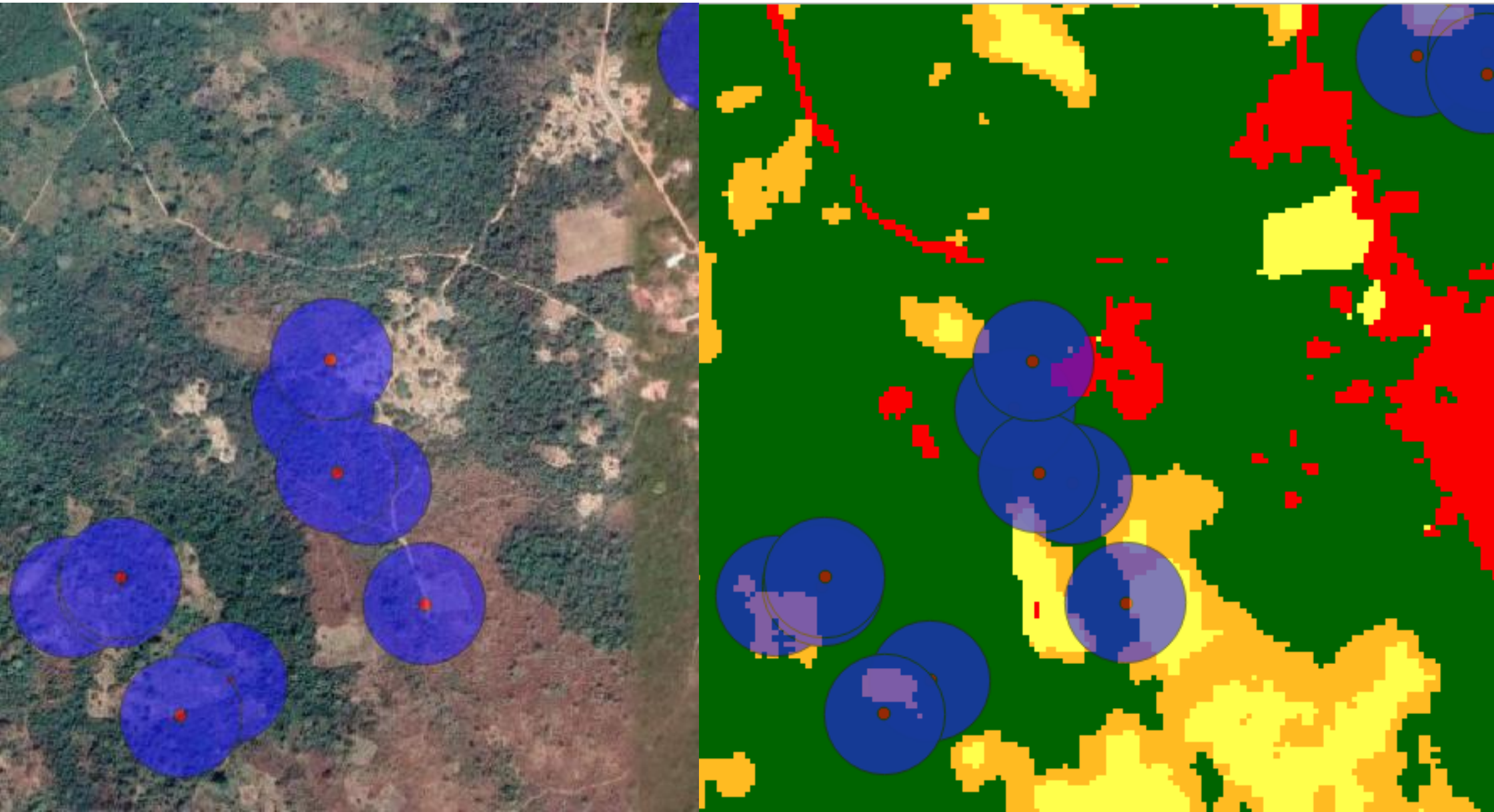
Forest conservation through beekeeping:

*Using satellite imagery to demonstrate the role of
beekeeping in protecting natural forests*

Christopher Keywood
Apimondia Congress 2025



Causation vs correlation



Do Beekeepers play a role in forest protection?

How?

- Alternative to forest degrading activities (Timber/Crops)
- Reliance on forests for bee forage/materials
- Prevent others from using their hive sites
- Protect hive areas from fire

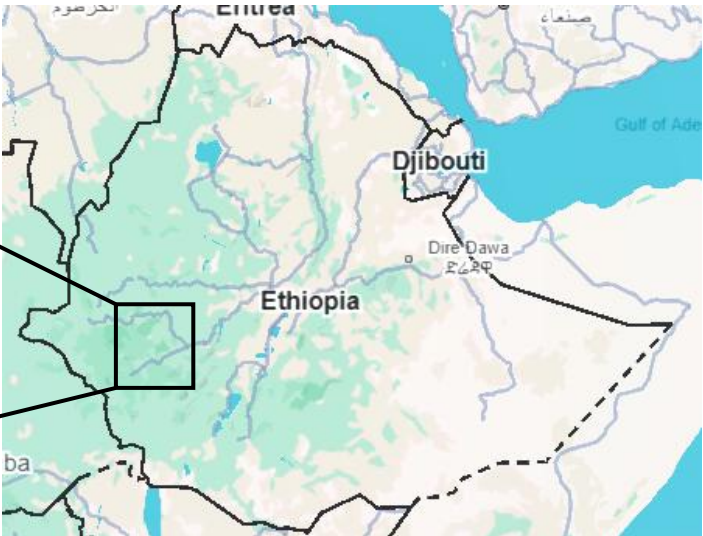
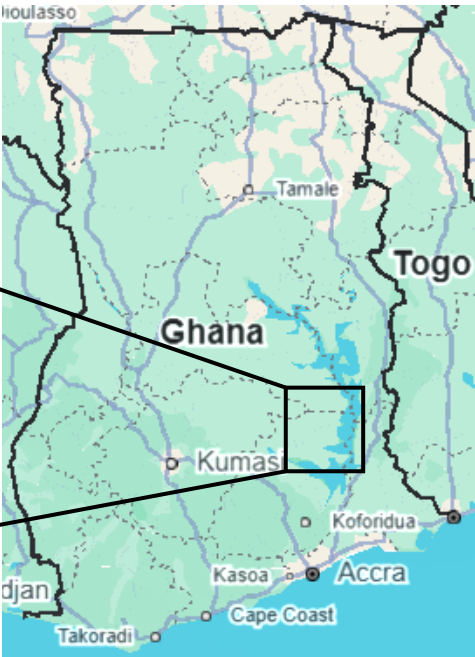
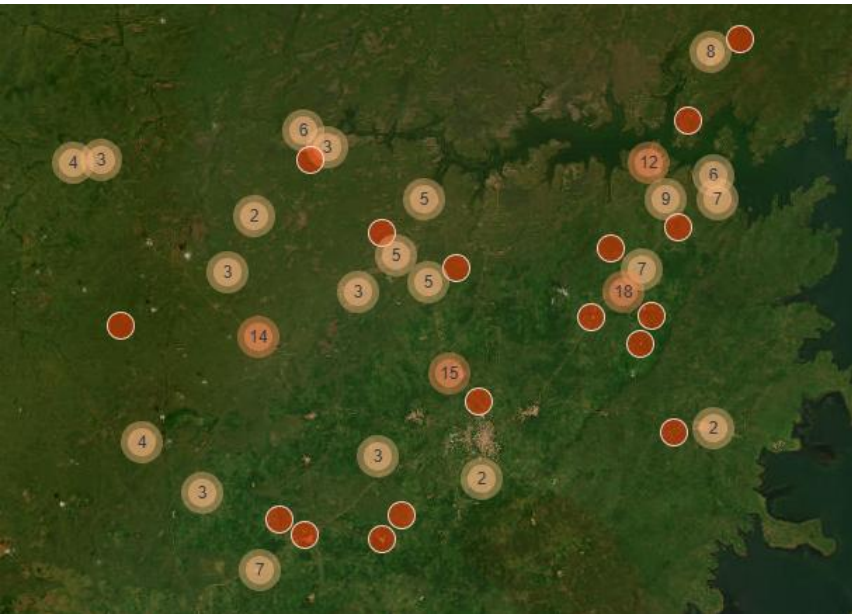
Limitations

- Cannot prevent large scale projects alone
- Need organising

Evidence?



Areas of study

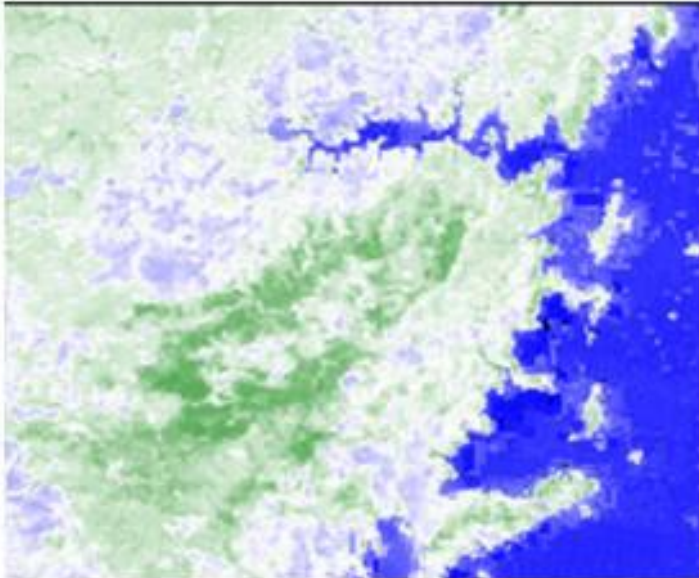


Satellites used

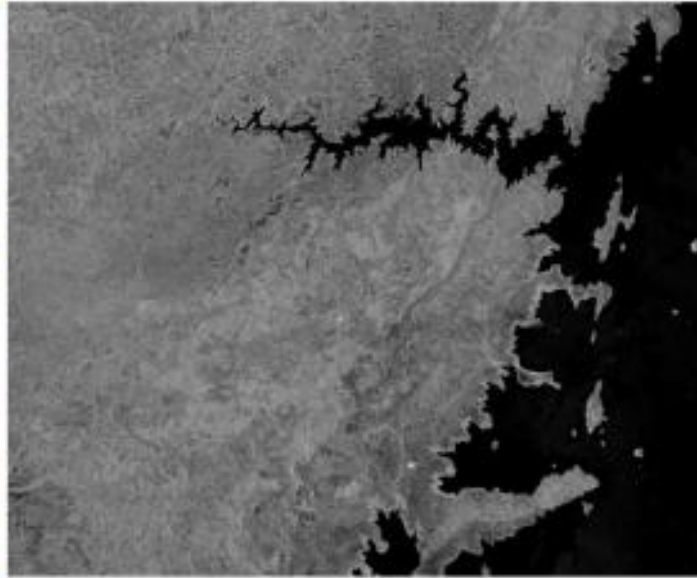
Sentinel-2



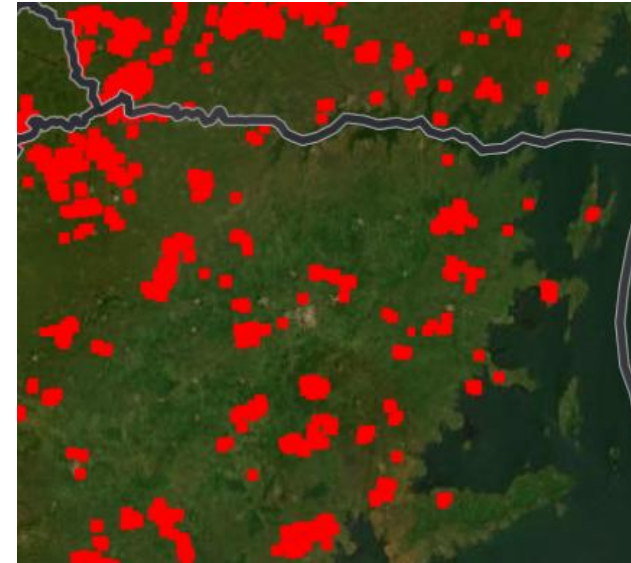
MODIS NDVI



Sentinel-2 VV



Viirs



Ghana

Mar 2015



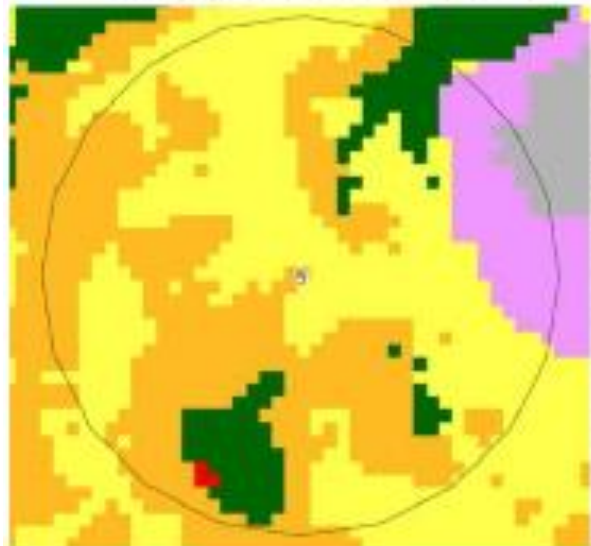
Jan 2017



Jan 2025



WorldCover V2 - 2021



GE - Jan, 2025



GE - Jan, 2017

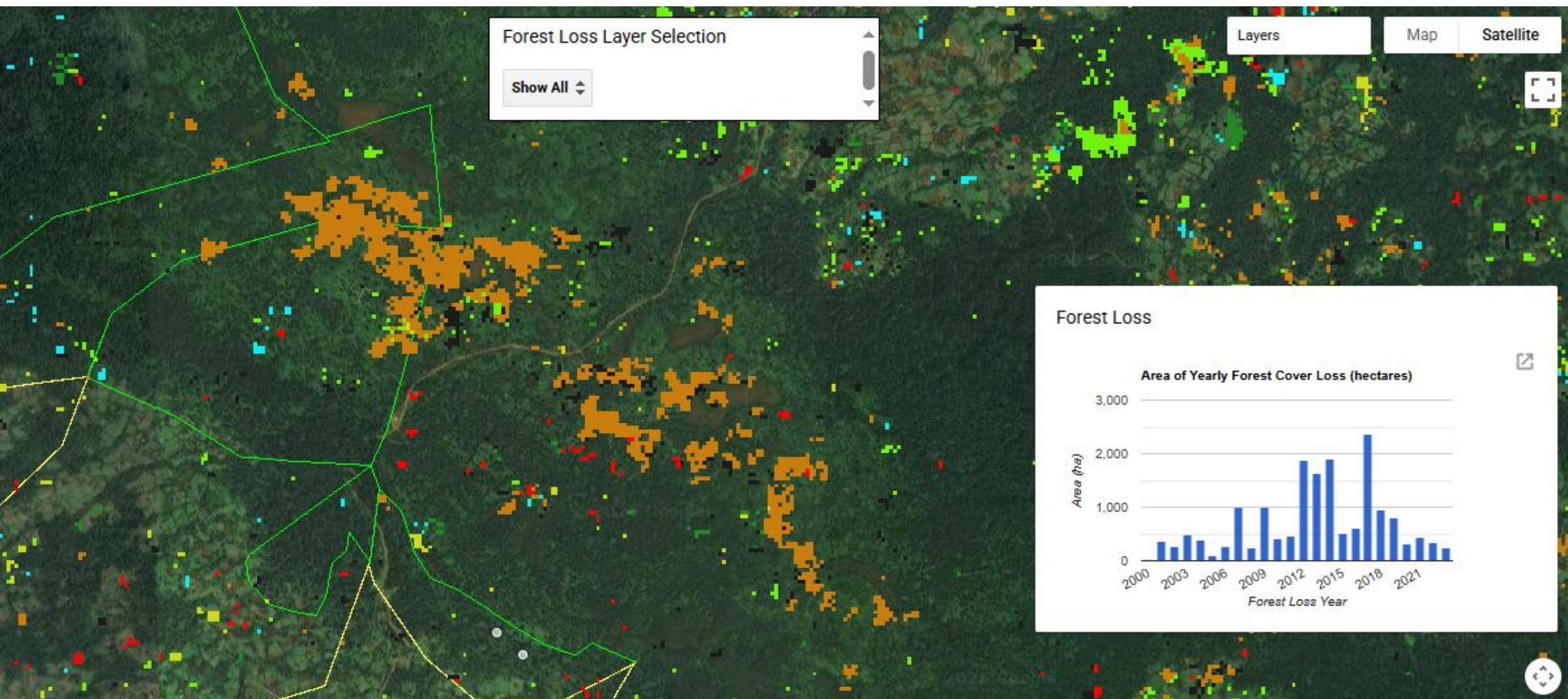


GE - Dec, 2012



Ethiopia





Ground level assessments

Table 2 Changes in forest condition scores and estimates of vegetation cover types in the study area, 2023-2025

Plot Location	Coordinates		Elevation (m)	2023	2025	2023	2025
	Northern	Western/Eastern		Disturbance Score [#]	Disturbance Score [#]	Vegetation Cover type [*]	Vegetation Cover type [*]
Bondaso	7.18084	-0.27519	109	4	3	B	B
Krachi	7.08882	-0.19126	122	4	5	C	C
Atonsua	7.0417	-0.24422	150	4	4	C	C
Mmradan,	7.01925	-0.21782	169	3	2	A	A
Bebuso	6.99812	-0.12998	209	4	4	C	C
Nton Aboma.	7.20081	0.01874	107	4	4	C	C
Kwakra,	7.18035	-0.00841	118	4	4	C	C
Adzase Kope	7.16994	0.02522	119	4	4	C	C
Bodua/Kubease	7.09732	-0.00474	174	4	3	C	C
Avatime	7.10669	0.00114	177	4	4	C	C

*Forest condition score

3 Slightly degraded. Obviously disturbed or degraded, but with good forest predominant; Maximum 50% slightly disturbed

4 Mostly degraded. Obviously disturbed and patchy, but with bad forest predominant; 75% degraded.

*Vegetation Type: (A) Intact Forest, (B) Open Forest, (C), Fallow land (D) Farmland (E) Marshy

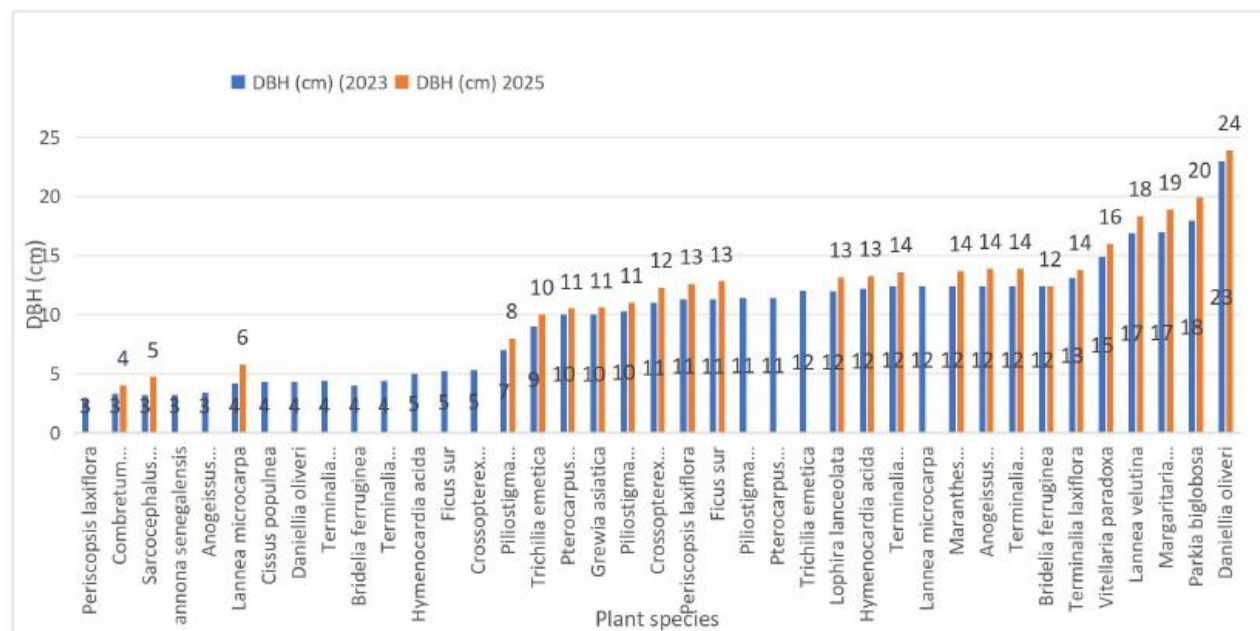
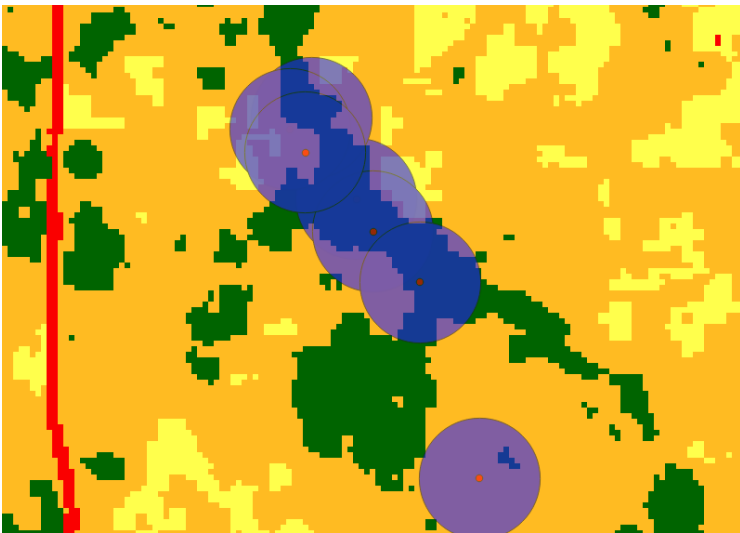
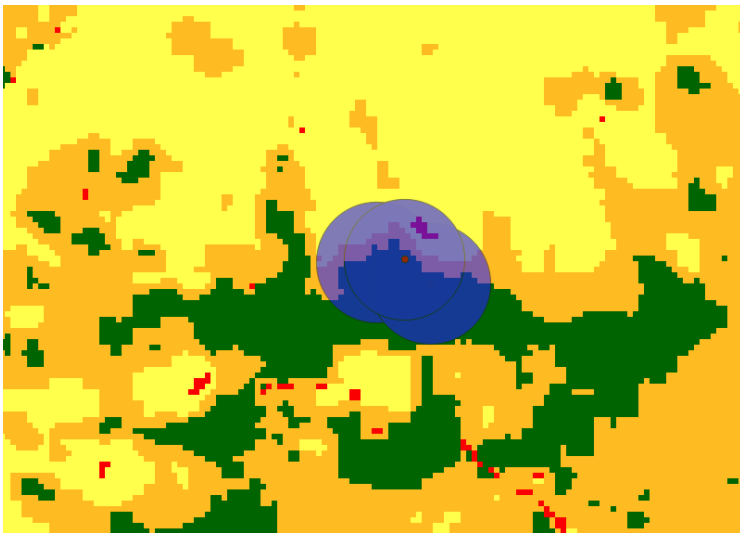
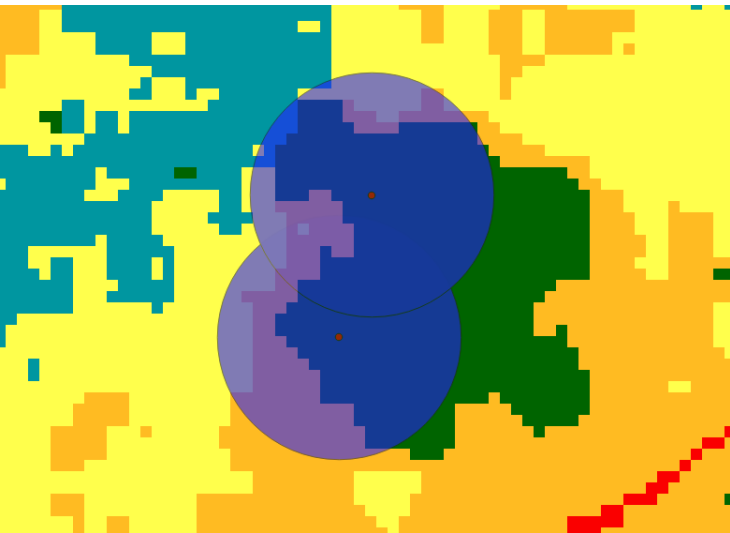
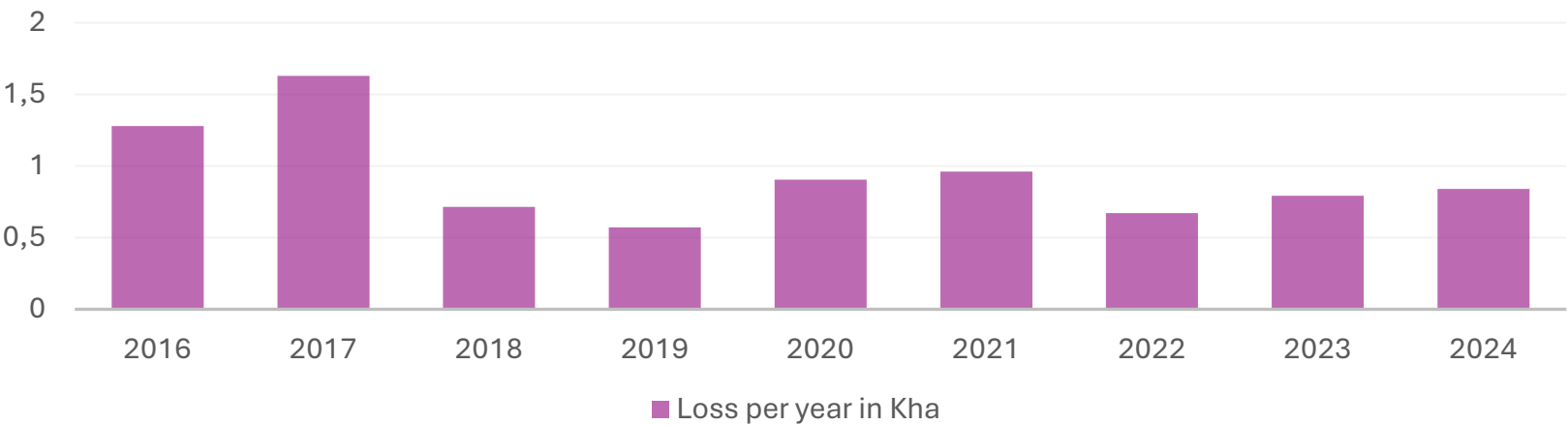


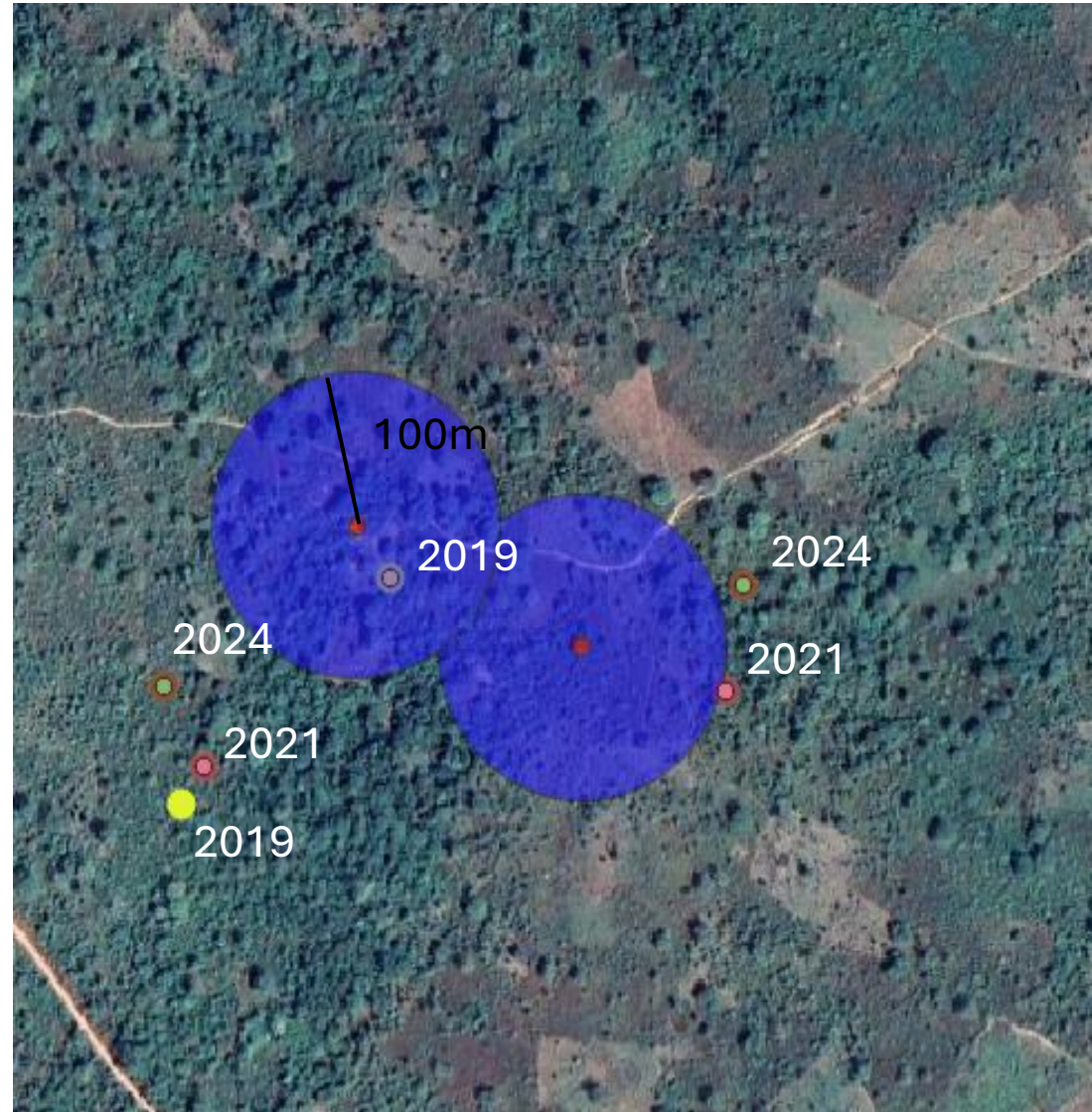
Figure 4. Trends in average diameter sizes of inventoried woody plant species in 1-ha plot at Atonsua (n=288, n=244), 2023-2025

Tentative results

Loss per year in Kha



Fire results



Thank you!

For more information:

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