

Mapping Ghana's Vanishing Tree Cover: Two Decades of Regional Loss and Shifting Deforestation Hotspots (2001–2024)

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Abstract

Ghana has lost a great deal of tree cover since 2000, but it is less clear where the loss is greatest and whether those places have changed over time. This study used satellite records of tree cover loss from 2001 to 2024 and counted the loss in each of Ghana's 16 regions. Only areas that had at least 30% tree canopy in 2000 were included. Out of about 6.97 million hectares of tree cover in 2000, about 1.75 million hectares (25.1%) were lost by 2024. Western, Ashanti, Eastern and Central regions account for most of it. Recorded loss was 311,000 hectares in 2001 to 2008, 508,000 in 2009 to 2016 and 933,000 in 2017 to 2024, but the data provider warns that loss before about 2015 is underreported because detection methods changed, so this rise is partly a measurement effect. Using only 2015 to 2024, loss rose by about 9%, from 532,000 hectares in 2015 to 2019 to 577,000 in 2020 to 2024. In that period Ashanti overtook Western as the region with the most loss, and Western North gained a larger share, while Western and Bono lost share. Western and Central regions lost the biggest share of their own tree cover (32.0% and 30.3%). The results show where and when tree cover was lost. They do not show why, so the causes discussed here are possibilities, not findings.

Keywords: tree cover loss, Ghana, satellite data, regional comparison, Google Earth Engine

1 Introduction

Trees and forests matter a lot in Ghana. They store carbon, protect water sources, shelter wildlife, and support the livelihoods of many rural households. Cocoa, the main tree crop in Ghana and Côte d'Ivoire, provides income to almost two million farmers across the two countries [4]. At the same time, Ghana's forest zone is under pressure from farming, logging, and the collection of firewood. In recent years, small-scale gold mining, widely known as *galamsey*, has added to the pressure. One satellite study of south-western Ghana estimated that about 47,000 hectares of vegetation were converted to mining between 2005 and 2019, mostly by small-scale artisanal mines, and that roughly half of this happened between 2014 and 2017 [3]. Cocoa farming has also been linked to forest loss. A study using satellite maps and machine learning found that cocoa was an underlying driver of more than 13% of forest loss inside Ghana's protected areas [4].

Satellites make it possible to track tree cover loss over many years in a consistent way. The Global Forest Change dataset [1] records, for every 30-metre square of land, whether and when tree cover was lost. It is widely used to report national totals. A national total, however, can hide differences inside the country. Decisions about enforcement, restoration and farming support are often made by region, so it helps to know which regions lose the most trees, which have lost the biggest share of what they had, and whether the places most affected have changed.

This paper asks three questions for Ghana's 16 regions from 2001 to 2024:

1. Which regions lost the most tree cover, in hectares?

2. Which regions lost the biggest share of the tree cover they had in 2000?
3. Did the places with the most loss change between 2001 to 2008, 2009 to 2016, and 2017 to 2024?

2 Data and Methods

2.1 Tree cover data

I used the Global Forest Change dataset, version 1.12 [1], through Google Earth Engine [2]. The dataset gives the percentage of each 30-metre square covered by tree canopy in the year 2000, and the year, if any, when that cover was lost between 2001 and 2024. I counted only land where canopy cover was at least 30% in 2000. This is a common cut-off, and I call the total area meeting it the "starting tree cover." Loss was counted only on that land.

2.2 Regional boundaries

Regional boundaries came from GADM version 4.1 [7], which has Ghana's 16 regions. Ghana had 10 regions until six more were created after a 2018 referendum, but loss here comes from satellite images and not from census records, so the same 16 boundaries could be used for every year. This keeps the regions comparable over time.

2.3 Measures

For each region, I added up the area lost in each year and then grouped the years into three periods of eight years: 2001 to 2008, 2009 to 2016, and 2017 to 2024. I then calculated:

- **Loss in hectares** for each period and in total.
- **Percentage lost:** total loss divided by the starting tree cover, times 100.
- **Share of national loss:** a region's loss in a period divided by Ghana's total loss in that period.
- **Rank:** regions ordered from most to least loss within each period, so that changes in order could be seen.

The percentage lost is reported only for regions with at least 10,000 hectares of starting tree cover. Regions with very little tree cover can show extreme percentages from a few hectares of loss, which would be misleading.

2.4 Checking the numbers

I compared my results with the Global Nature Watch [6] page for Ghana (accessed 20 October 2026), which uses the same 30% canopy cut-off. It reports 7.0 million hectares of tree cover in 2000, and mine is 6.97 million. For 2001 to 2025 it lists 450,000, 440,000, 260,000, 240,000 and 180,000 hectares lost in Western, Ashanti, Eastern, Central and Western North. My totals for 2001 to 2024 are 431,000, 411,000, 246,000, 227,000 and 164,000 hectares, which are about 13,000 to 29,000 hectares lower in each region, as expected because their record includes one more year. Both give the same top three regions, responsible for 62% of the loss. Their national total for 2001 to 2025 is 1.9 million hectares, or 27% of the 2000 tree cover. My total to 2024 (1.75 million hectares) plus roughly 117,000 hectares for 2025, read from their chart, comes to about 1.87 million hectares, which rounds to the same figure. My yearly pattern, including the peak in 2018, also matches their chart. An earlier report of Global Forest Watch data, by Jonny-Nuekpe [5], gave regional totals for 2001 to 2024 of 432,000, 411,000, 246,000, 227,000 and 164,000 hectares, which match mine to within a few hundred hectares.

2.5 A change in the data methods

The Global Nature Watch page for Ghana warns that the methods behind the data changed over time, which means tree cover loss before 2015 is underreported, and it advises against comparing the data from before and after 2015. This matters for this paper, because my three eight-year periods cross that point. I therefore report the full record as a description of what the data show, and treat the rise over time with caution. As a check, I repeated the regional comparison using only 2015 to 2019 and 2020 to 2024, when the methods are more consistent.

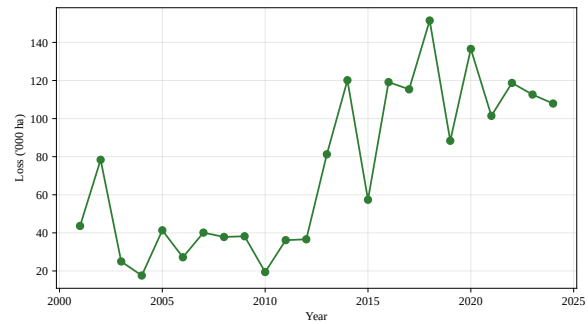


Figure 1: Yearly tree cover loss in Ghana, 2001 to 2024.

3 Results

3.1 Loss across Ghana

In 2000, Ghana had about 6.97 million hectares of tree cover at the 30% level. By 2024, about 1.75 million hectares of it (25.1%) had been lost. Yearly loss was uneven in 2001 to 2008, ranging from about 17,600 hectares in 2004 to 78,400 hectares in 2002. It was higher from 2013 on, and in every year since 2017 it has been above 88,000 hectares. The highest year was 2018, at about 151,500 hectares (Figure 1). Loss in 2001 to 2008 was 311,000 hectares, in 2009 to 2016 it was 508,000 hectares, and in 2017 to 2024 it was 933,000 hectares. Recorded loss in the last eight years was three times that of the first eight. However, much of this difference probably comes from changes in how loss was detected (Section 2.5), so it should not be read as a true tripling.

3.2 Where the most trees were lost

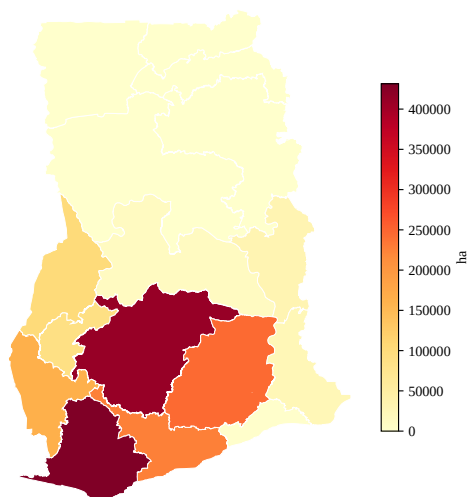
Almost all the loss is in the southern part of the country (Table 1 and Figure 2). The five regions with the most loss were Western (431,000 hectares), Ashanti (411,000), Eastern (246,000), Central (227,000) and Western North (164,000). The first three of these together account for 62% of Ghana's loss. The northern regions (Upper East, Upper West, North East, Northern and Savannah) lost very little. This is mostly because few places there had enough tree cover to be counted in the first place.

3.3 Share of tree cover lost

Western lost the biggest share of its 2000 tree cover (32.0%), followed by Central (30.3%), Ashanti (27.1%), Eastern (25.2%) and Bono (25.1%) (Figures 3 and 4). Western North is different. It had the fifth-largest loss in hectares, but this was only 17.0% of its starting tree cover, because it began with a very large area (about 970,000 hectares).

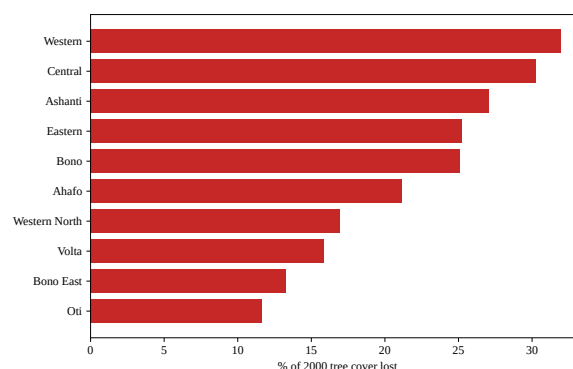
Table 1: Starting tree cover (2000), loss in each period, total loss, and percentage lost, by region. The percentage is left blank (-) where starting tree cover was below 10,000 hectares.

Region	Start (ha)	2001-08	2009-16	2017-24	Total (ha)	Lost (%)
Western	1,348,865	98,393	134,564	198,500	431,457	32.0
Ashanti	1,518,527	56,467	132,996	221,554	411,018	27.1
Eastern	974,555	35,531	66,475	143,605	245,611	25.2
Central	750,649	54,985	59,939	112,266	227,190	30.3
Western North	969,682	28,147	44,352	91,920	164,419	17.0
Bono	415,698	12,583	30,352	61,331	104,266	25.1
Ahafo	426,383	11,680	23,082	55,351	90,113	21.1
Oti	282,783	3,429	6,153	23,434	33,015	11.7
Volta	165,718	1,946	5,954	18,398	26,298	15.9
Bono East	104,370	5,864	3,004	5,016	13,885	13.3
Greater Accra	7,707	856	1,101	1,142	3,098	-
Savannah	3,805	902	365	30	1,298	-
Northern	409	247	60	2	309	-
Upper West	63	48	14	0	61	-
North East	68	49	5	0	54	-
Upper East	10	7	0	0	8	-

**Figure 2:** Total tree cover loss by region, 2001 to 2024, in hectares.

3.4 How the main areas of loss changed

Western had the most loss in both 2001 to 2008 and 2009 to 2016, with 31.6% and 26.5% of the national total. In 2017 to 2024 Ashanti took first place (23.8%) and Western fell to second (21.3%) (Table 2, Figures 5 and 6). Between the first and last periods, Ashanti's share rose by 5.6 percentage points, Eastern's by 4.0, Bono's by 2.5 and Ahafo's by 2.2. Western's share fell by 10.3 points and Central's by 5.6. Bono East's share also dropped, from 1.9% to 0.5%. In short, the heaviest loss appears to have moved from the south-west and coast toward the middle of the forest zone and the Bono and Ahafo area. Because of the change in data methods, these shifts need checking, which is done in the next section.

**Figure 3:** Share of 2000 tree cover lost by 2024, for regions with at least 10,000 hectares of starting tree cover.**Table 2:** Rank by loss in each period, with share of national loss (%) in brackets. Top seven regions.

Region	2001-08	2009-16	2017-24
Western	1 (31.6)	1 (26.5)	2 (21.3)
Ashanti	2 (18.1)	2 (26.2)	1 (23.8)
Eastern	4 (11.4)	3 (13.1)	3 (15.4)
Central	3 (17.7)	4 (11.8)	4 (12.0)
Western North	5 (9.0)	5 (8.7)	5 (9.9)
Bono	6 (4.0)	6 (6.0)	6 (6.6)
Ahafo	7 (3.8)	7 (4.5)	7 (5.9)

3.5 Check using 2015 to 2024 only

When only 2015 to 2024 is used, national loss rose from 531,800 hectares in 2015 to 2019 to 577,300 hectares in 2020 to 2024, an increase of about 9%. This is far smaller than the threefold rise in the full record. Some of the shifts between regions held up and some did not (Table 3). Ashanti took first place in 2020 to 2024 (26.4% of national loss, up 4.6 percentage points) and Western fell to second (20.1%, down 3.4 points), which matches the

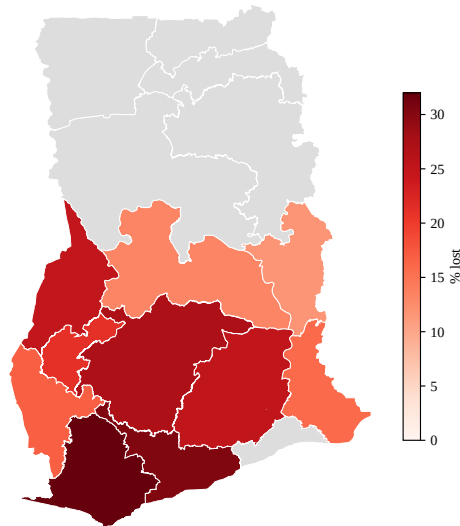


Figure 4: Share of 2000 tree cover lost, by region. Grey regions had under 10,000 hectares to start with.

main result. Western North's share also rose, from 8.4% to 10.6%. The other changes were not repeated: Eastern's and Central's shares were nearly unchanged (each down 0.8 points), Ahafo's rose only slightly (0.6 points), and Bono's share fell by 2.8 points, the opposite of the full-record result.

4 Discussion

Three things come out of these results. Recorded loss is large: a quarter of the tree cover Ghana had in 2000 is gone by 2024. The loss is concentrated in a few southern regions. And Ashanti has become the largest area of loss, overtaking Western, a result that also holds in the 2015 to 2024 check. The apparent rise in national loss over the full record needs care. Because of the change in data methods, it is partly a measurement effect, and when only 2015 to 2024 is compared, loss rose by about 9%, not threefold.

The data used here cannot say what caused the loss, so the following are possible explanations, not conclusions. For 2001 to 2025, Global Nature Watch reports that about 1.6 of Ghana's 1.9 million hectares of loss happened where permanent agriculture was the main driver. Hard commodities followed with about 210,000 hectares, then settlements and infrastructure (65,000 hectares) and logging (11,000 hectares) [6]. These are national figures, and I did not break them down by region. Studies of particular drivers point the same way. Barenblitt et al. [3] found that about half of the mining they mapped in south-western Ghana happened between 2014 and 2017, which may help explain the high loss in the south-west. Kalischek et al. [4] link cocoa to forest loss, although their finding is about protected areas and not about whole regions. I did not test any of these

explanations. Testing them would need maps of mining areas, cocoa farms and land use for the same regions and years.

The percentage figures tell a slightly different story from the hectare figures. Western and Central lost the biggest shares of what they had, which means they now have less left relative to where they started. Western North lost a lot of land in absolute terms but still keeps most of its tree cover.

5 Limitations

- **Tree cover loss is not the same as deforestation.** The dataset records any loss of tree cover, including harvested plantations, tree crops such as cocoa, fires and storm damage, and some of this land may grow trees again. For Ghana, however, Global Nature Watch reports that 98% of loss from 2001 to 2025 happened where the main drivers lead to deforestation, so this limit matters less here than in many other countries.
- **The data methods changed over time.** Global Nature Watch warns that loss in Ghana before 2015 is underreported and advises against comparing before and after 2015. This weakens the full-record trend in this paper. The 2015 to 2024 check reduces the problem, but it covers only ten years.
- **The 30% cut-off leaves out sparse tree cover.** This affects the northern savanna most. Results for those regions say little, which is why their percentages are not reported.
- **Regions are large.** Local hotspots, such as mining areas inside a region, are not visible at this scale.
- **Boundaries.** The current 16 regions were applied to all years. The GADM boundary file was not checked against official boundaries, so small differences are possible.
- **No field checks.** Results were compared with published totals from Global Forest Watch and Global Nature Watch, but not with ground data.

6 Conclusion

Between 2001 and 2024, Ghana lost about a quarter of the tree cover it had in 2000, according to the satellite record. Most of it happened in Western, Ashanti, Eastern and Central regions, and Western and Central lost the largest share of their own tree cover. The main area of loss moved from Western region to Ashanti, and this holds when only 2015 to 2024 is used. The threefold rise in recorded loss between the first and last eight years is partly caused by changes in detection, and the 2015 to 2024 comparison shows a rise of only about 9%. Future

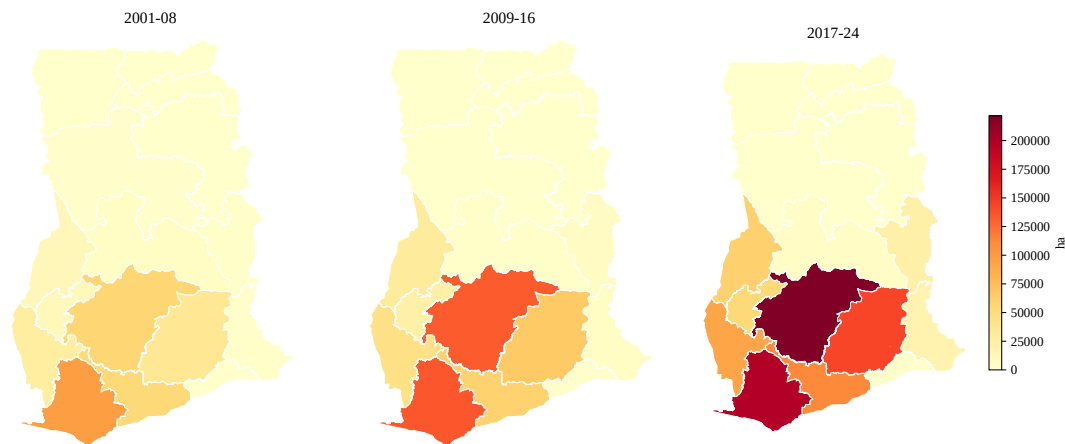


Figure 5: Tree cover loss by region in each period, shown on the same colour scale.

Table 3: Loss in hectares, with rank and share of national loss (%) in brackets, using 2015 to 2019 and 2020 to 2024 only. Top seven regions.

Region	2015-19	2020-24
Ashanti	115,443 (2; 21.7)	152,127 (1; 26.4)
Western	125,057 (1; 23.5)	116,158 (2; 20.1)
Eastern	82,778 (3; 15.6)	85,017 (3; 14.7)
Central	65,735 (4; 12.4)	66,898 (4; 11.6)
Western North	44,539 (5; 8.4)	61,183 (5; 10.6)
Ahafo	29,451 (7; 5.5)	35,362 (6; 6.1)
Bono	44,095 (6; 8.3)	31,536 (7; 5.5)

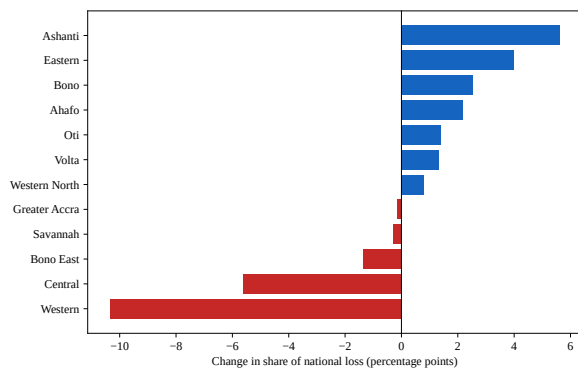


Figure 6: Change in each region's share of national loss between 2001 to 2008 and 2017 to 2024. Only regions with more than 1,000 hectares of total loss are shown.

work could repeat this at district level, connect the patterns to mining and cocoa data, and separate permanent loss from loss that later regrows.

Data availability

Global Forest Change version 1.12 is available in Google Earth Engine (UMD/hansen/global_forest_change_2024_v1_12). Boundaries are from GADM version 4.1 (<https://gadm.org>).

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