



# Land use changes and impacts on people, biodiversity and ecosystem services: Case study of the Nawa region in Cote d'Ivoire

West Africa land use workshop  
Abuja, 24-25<sup>th</sup> November 2016



# Outline

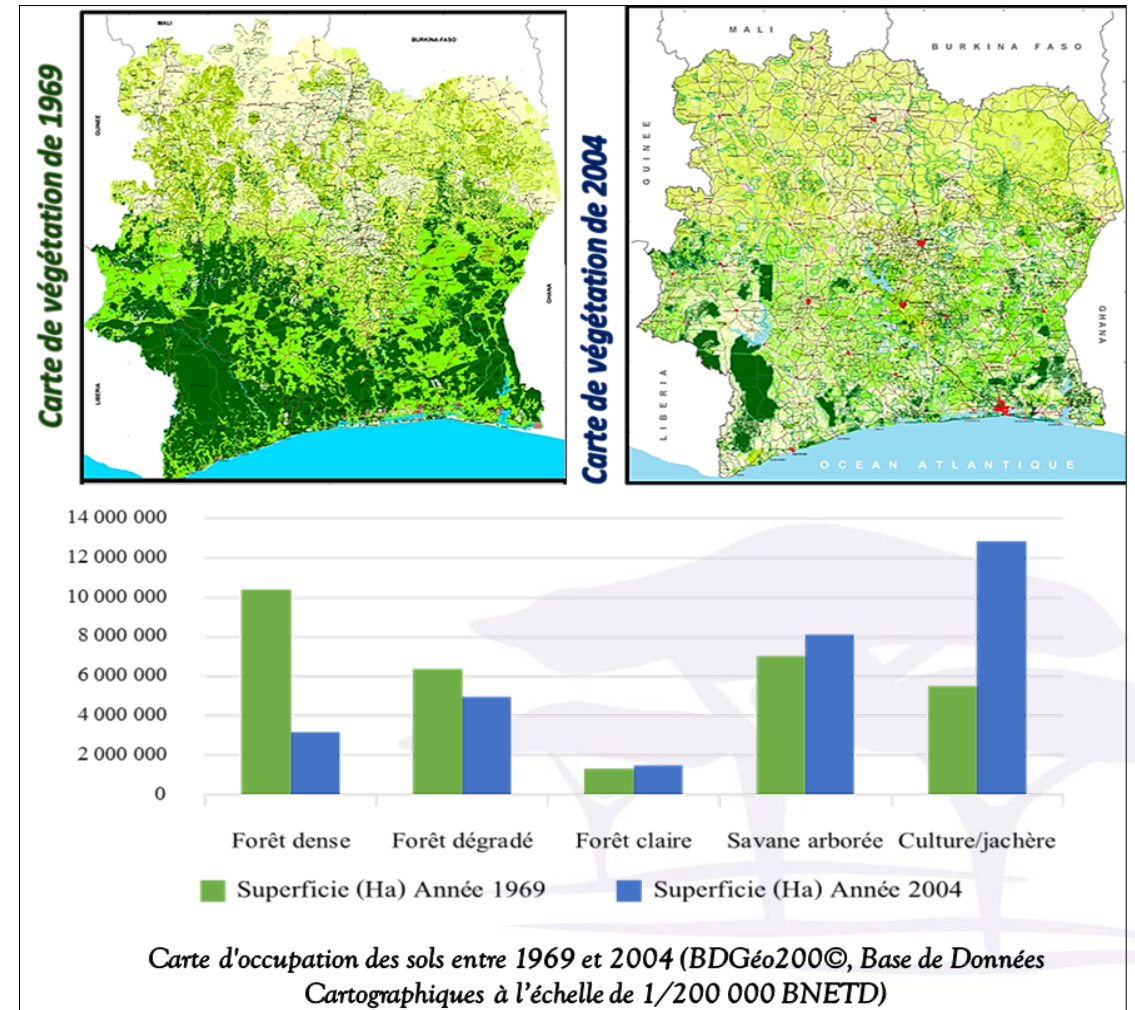
1. Background
2. Land use/cover changes in the region
3. Key drivers
4. Ecosystem transformation
5. Conclusion



# Situation with forests and woodlands in West Africa

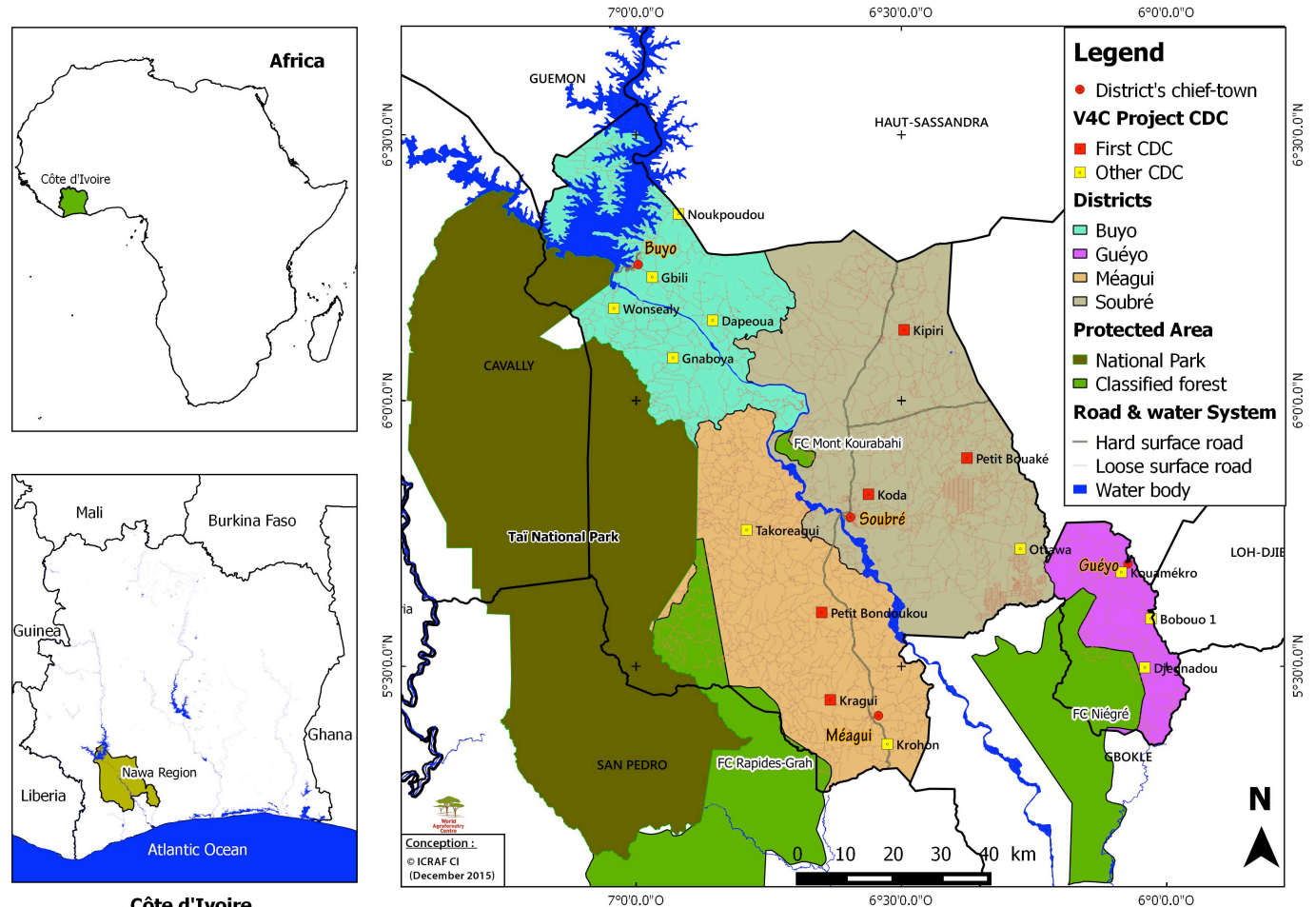
## Cote d'Ivoire

- Forest and woodland reduced from 10 mil to 3 mil ha from 1969 to 2004 (BNETD, 2004)
- Degradation of protected forest increased from 20% in 2002 to more than 80% in 2012 (UNEP, 2015)
- What are the drivers?
- How does it affect the landscape?



# Background

- The SW region is home of the main natural forest in Cote d'Ivoire, the Taï National Park (TNP), 536 000 ha
- TNP is a UNESCO world heritage site since 1982.
- 4 protected forests: Rapide Grah (315 000 ha), Mont Kourabahi (3 350 ha), Niègre (92 500 ha) et Niouniourou 2 (13 000 ha).
- Land use change in the last three decades threaten the environmental sustainability of the landscape.

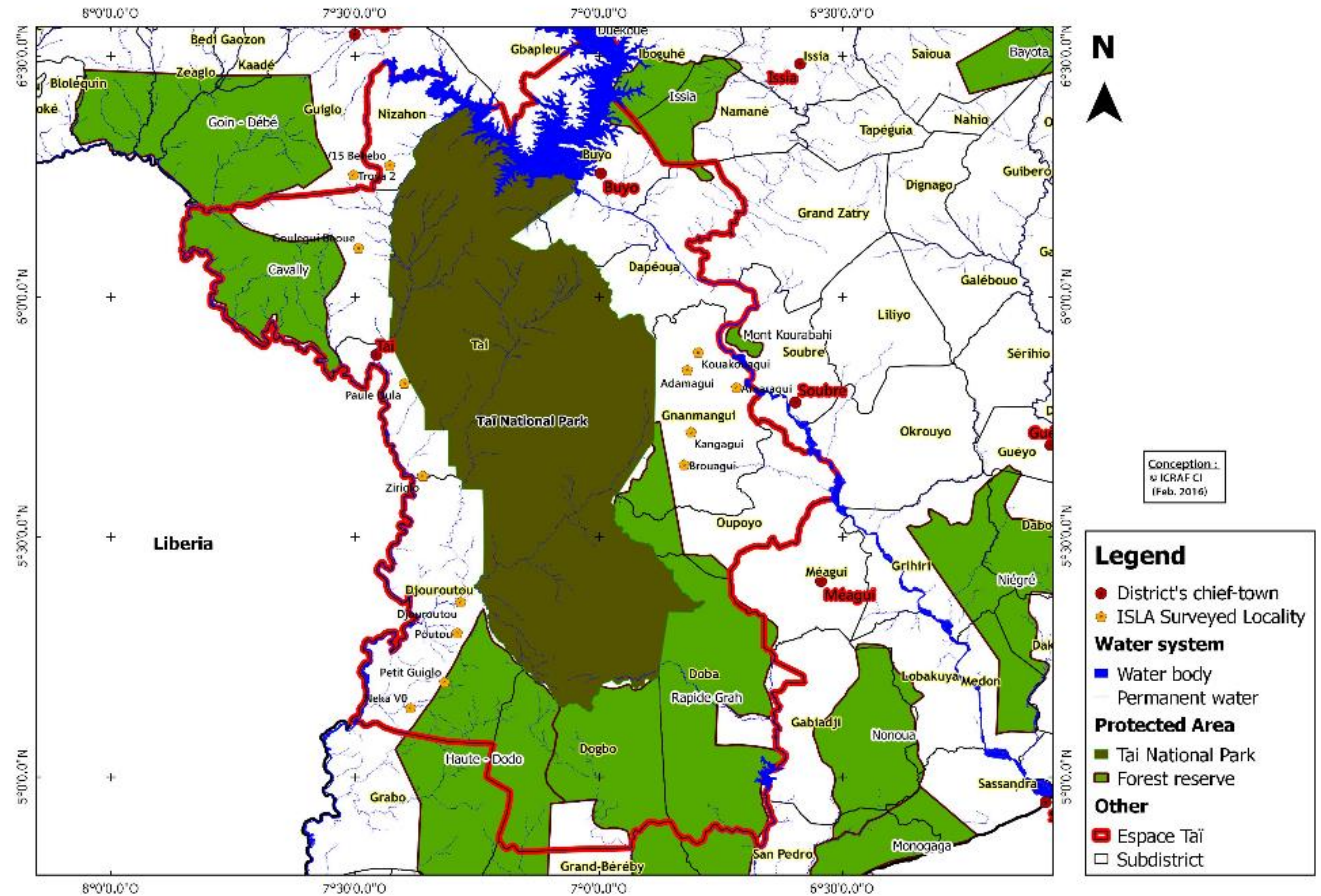


Côte d'Ivoire  
The Nawa region with its protected forests



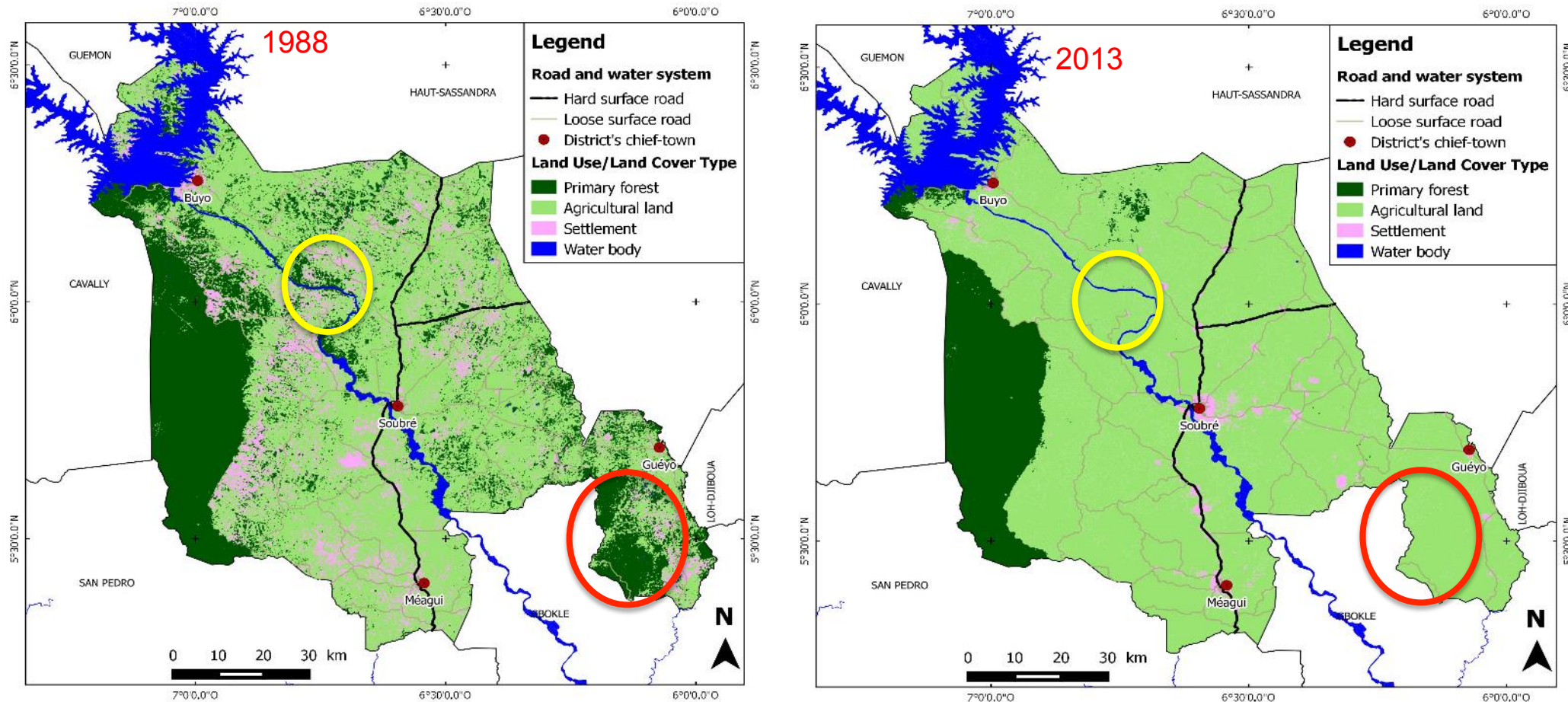
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The Nawa region with its protected forests

# Land use change

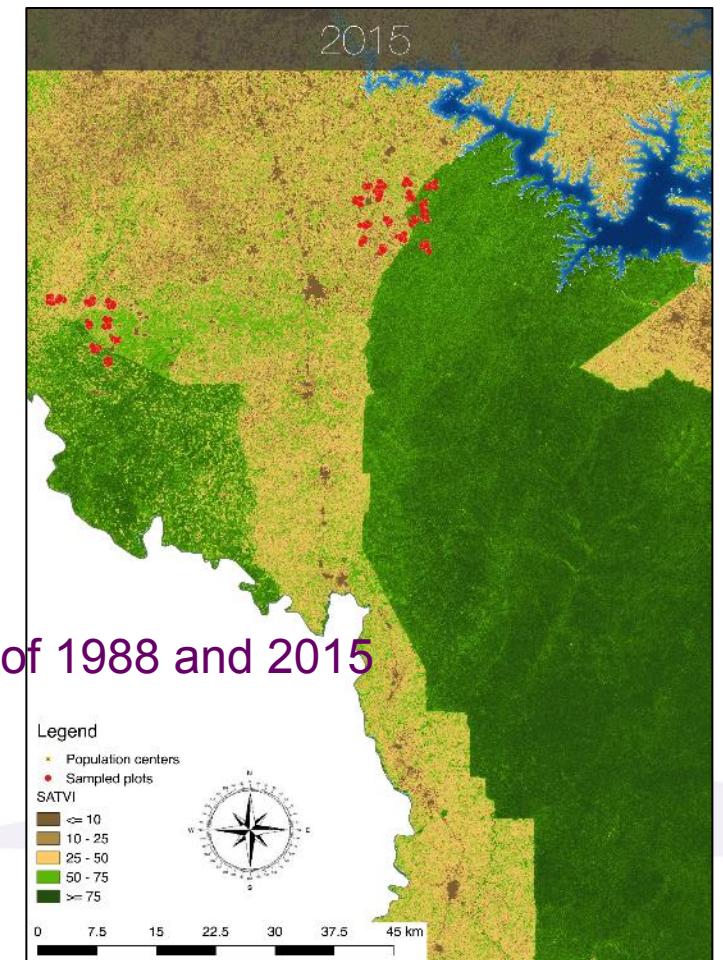
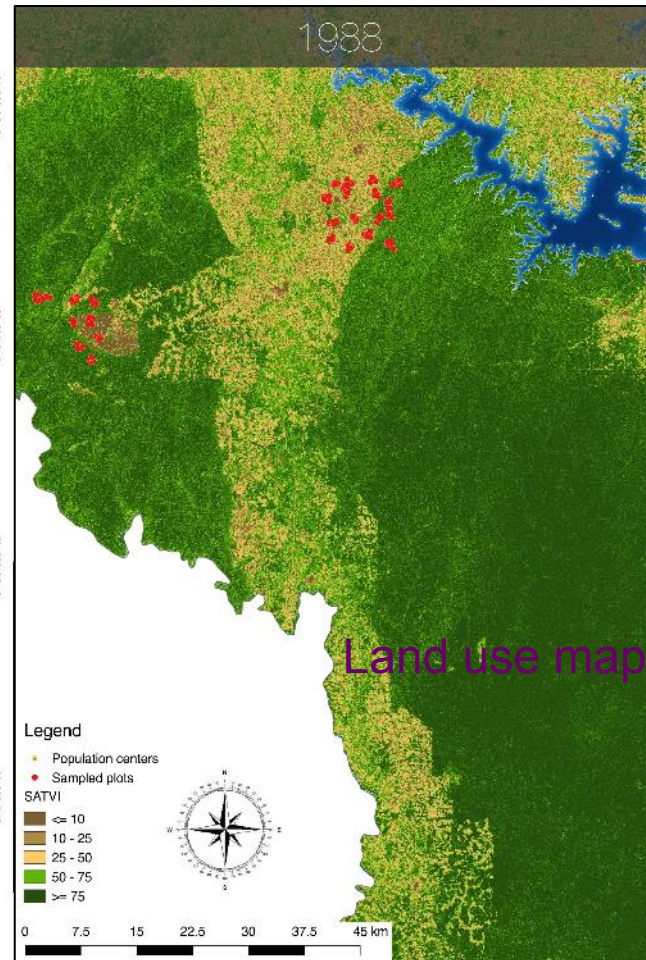
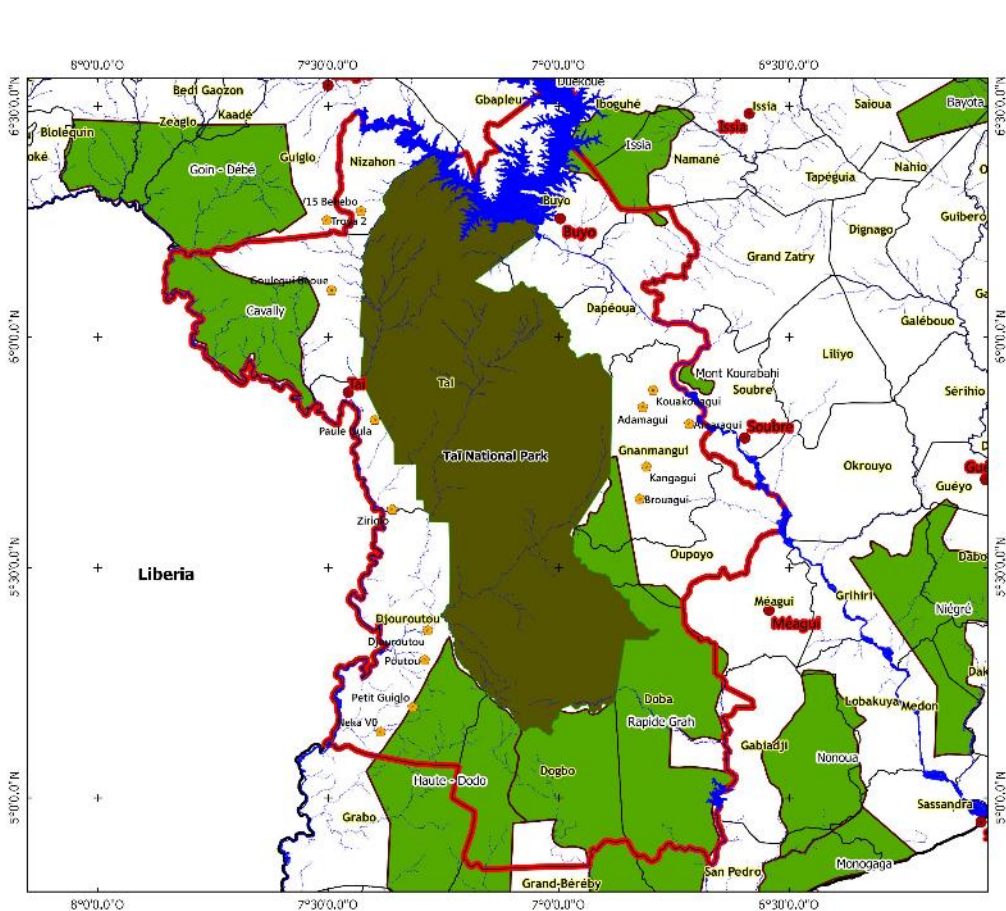


Land cover change in the Nawa region from 1988 à 2013

Source : Kouassi et al. 2014



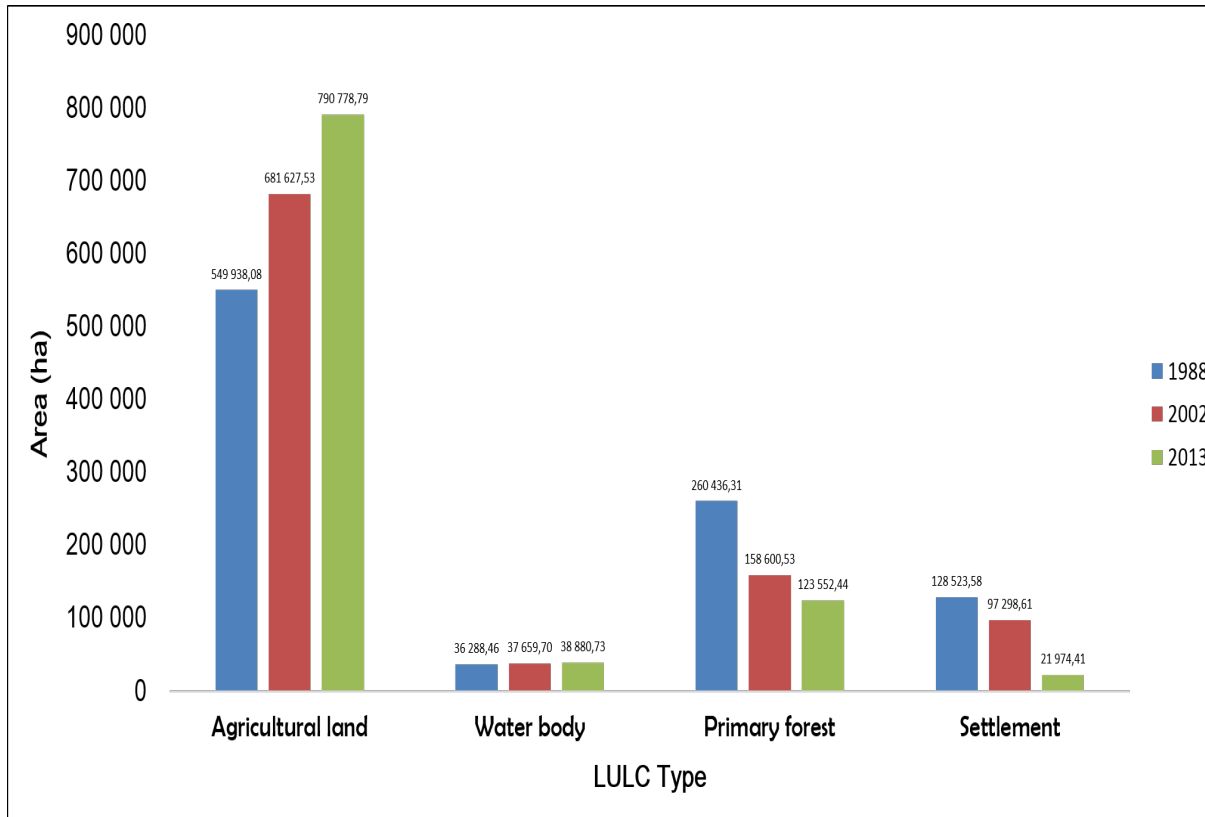
# Land use change



Land use maps of 1988 and 2015

Change over the last 25 years, mainly due to deforestation and conversion/replacement of forest with cultivation and grassland

# Land use change



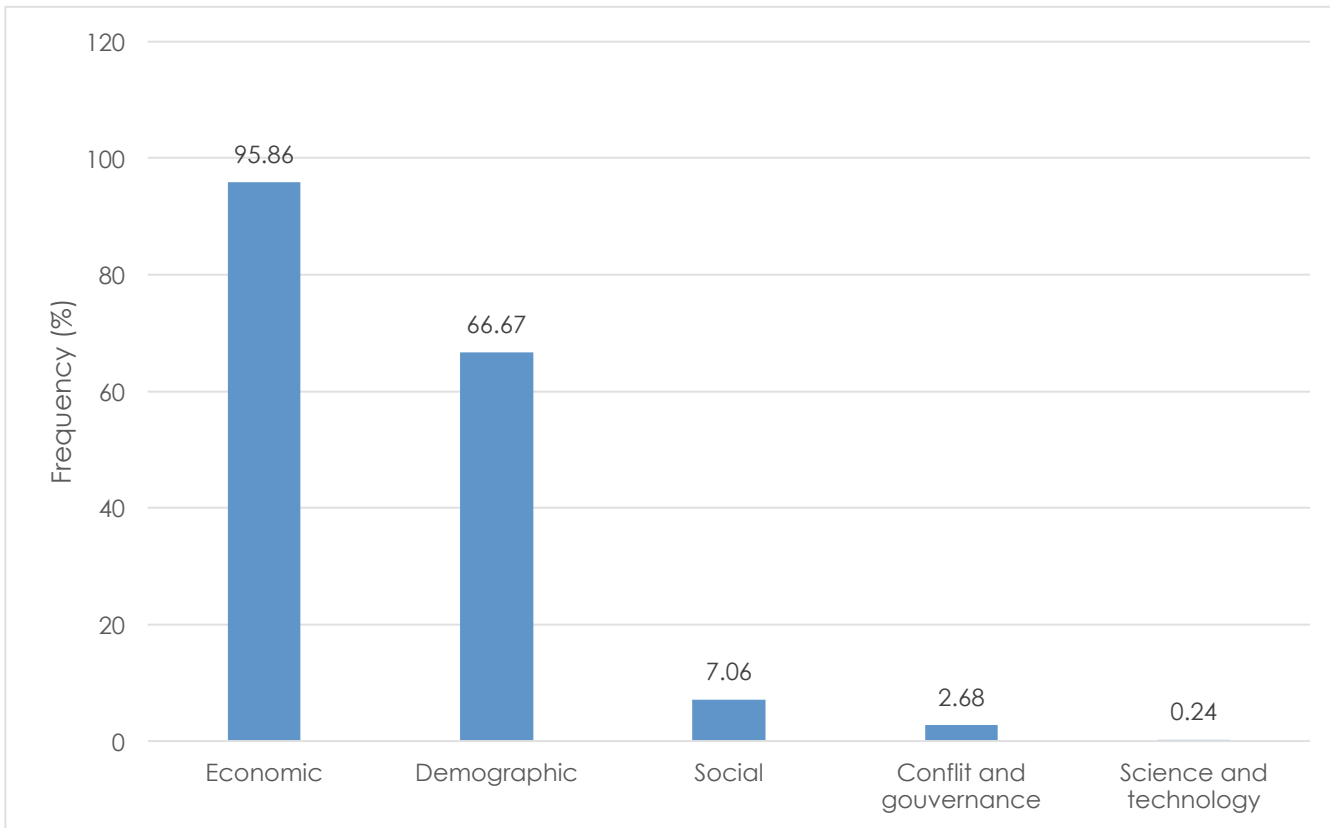
Land use change in the Nawa region

Source : Kouassi et al. 2014

- Conservation @ 97,6% forest zone of the TNP (OIPR, 2015)
- In the buffer zone of PNT 2003 to 2011, reduction of:
  - Areas of primary forest : 10.5 to 0.6%
  - degraded forest: 15,5 to 6.1% (Varlet, 2013).



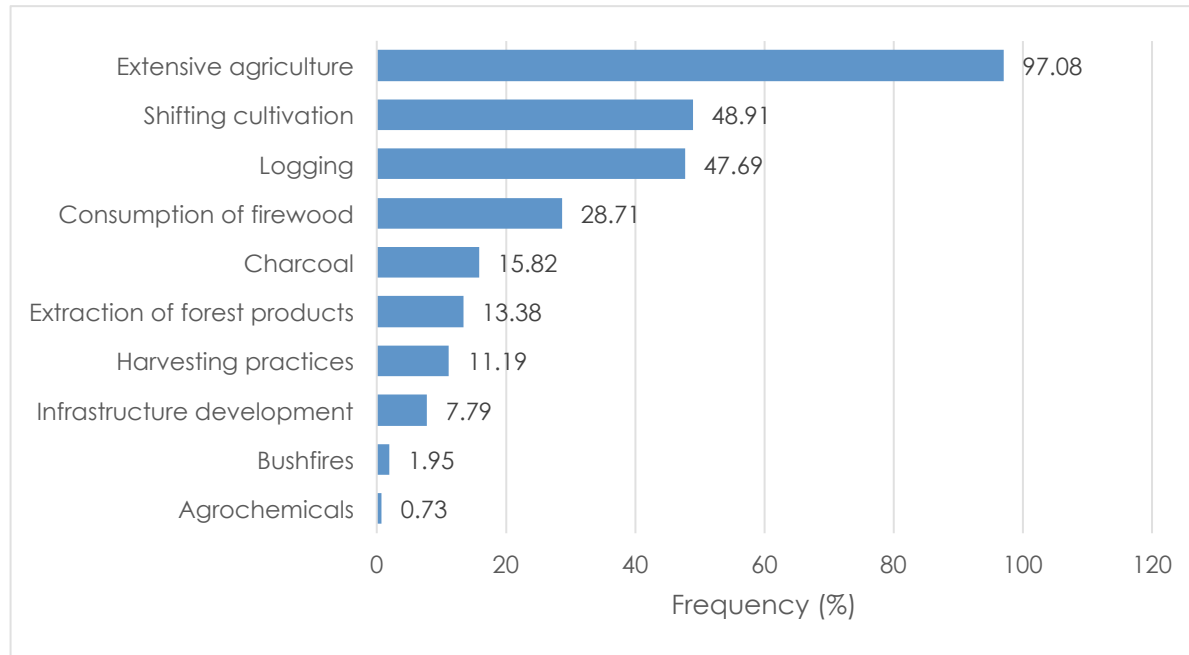
# Key drivers



Key drivers of land use change

- 1. Rapid population increase**
  - Population in the Nawa nearly doubles in 16 years from 678 000 to 1100 000 from 1998 to 2014 (RGPH, 2014)
  - 108 inhabitants/km<sup>2</sup>
  - Massive migration from other region of the country and neighboring countries

# Key drivers



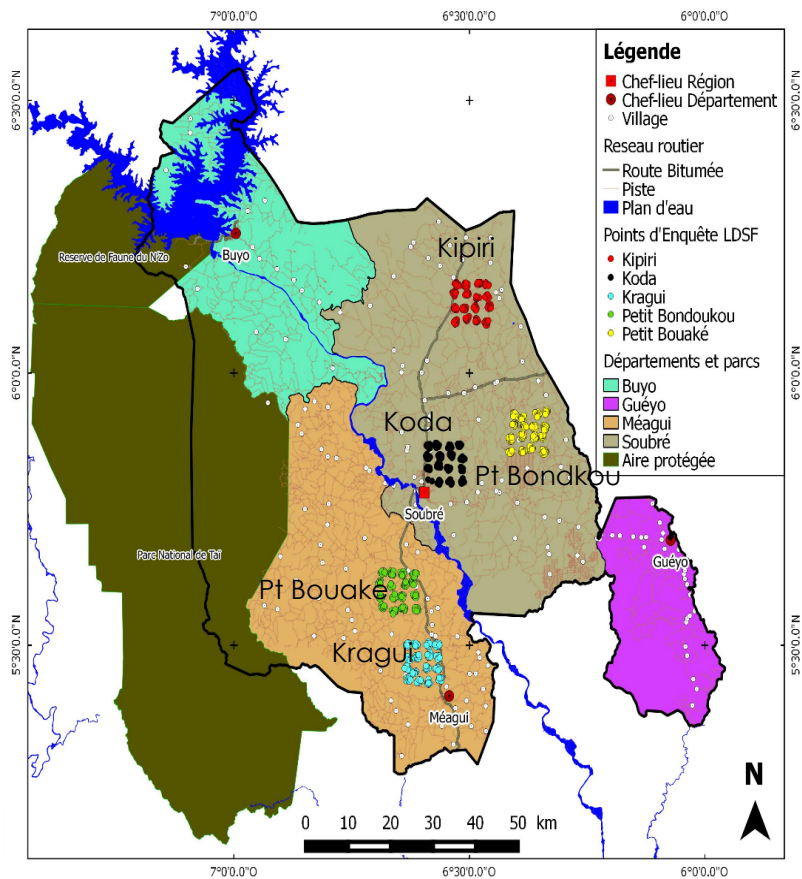
## 2. Economic drivers

- Agriculture (Plantation crops cocoa, rubber, oil palm)
- Wood Logging
- Artisanal mining





# Key drivers



	Kipiri	Koda	Kragui	Petit-Bondoukou	Petit-Bouake
	%				
Cacao	<b>63.8</b>	<b>48</b>	<b>65</b>	<b>62.5</b>	<b>83.1</b>
Rubber tree	7.5	32.3	10.6	5.6	2.5
Oil palm	0	0	0	1.3	6.9
Food crops	15.6	7.2	13.8	16.9	6.3
Fallow	11.3	7.9	9.4	13.1	1.3
Degraded forest	1.9	4.6	1.3	0.6	0

Agricultural use (%)

Source: Diby et al. 2015

# Ecosystem transformation: loss of biodiversity

Species abundance  
in the different land  
uses

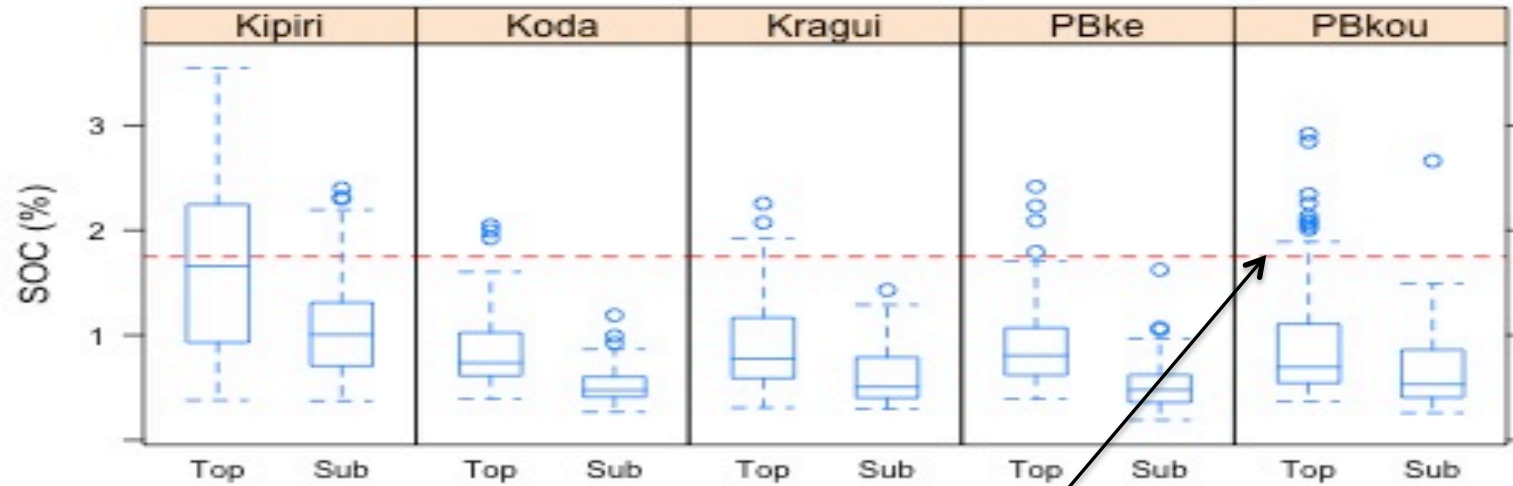
Land uses	Species	Genera	Families
	Number		
Cocoa	22	19	18
Primary forest	63	50	37
Degraded forest	98	68	39
Rubber	15	14	8
Fallow	69	60	33
<b>Total</b>	<b>170</b>	<b>125</b>	<b>61</b>

Average biomass,  
carbon stock and CO<sub>2</sub>  
equivalent in the  
different land uses

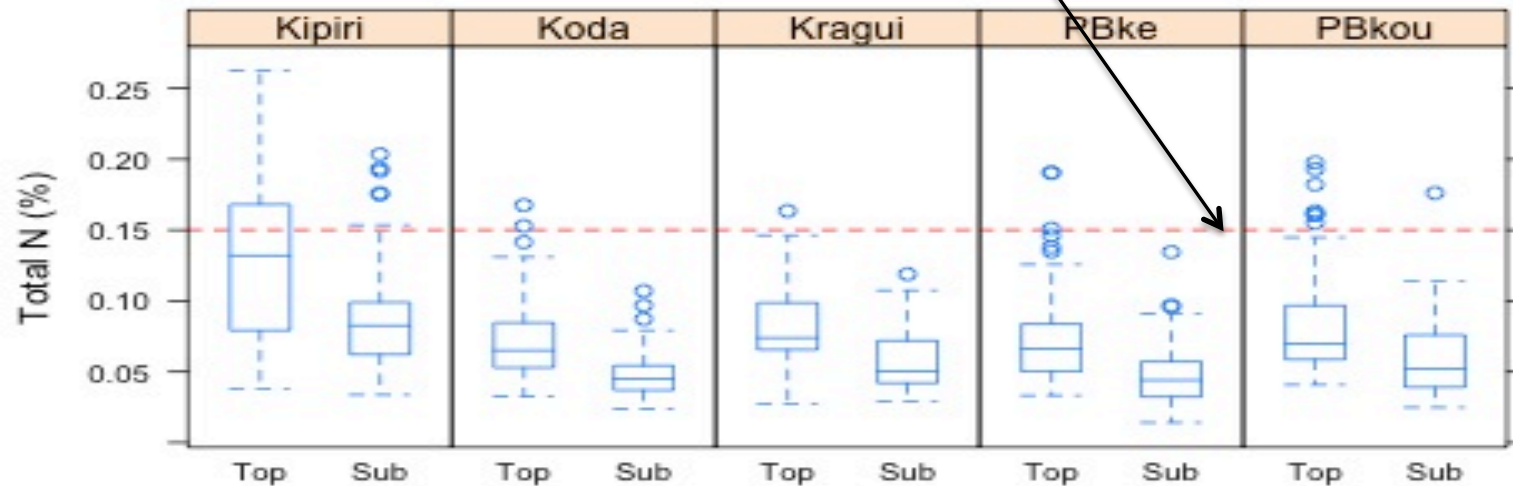
Land uses	Total biomass	Carbon	CO <sub>2</sub> equivalent
	(tons/ha)		
Cocoa	34.40	17	4.64
Primary forest	448.70	224	60.57
Secondary forest	240.10	120	32.41
Rubber	134.80	67	18.20
Fallow	121.40	61	16.39



# Ecosystem transformation: Soil degradation

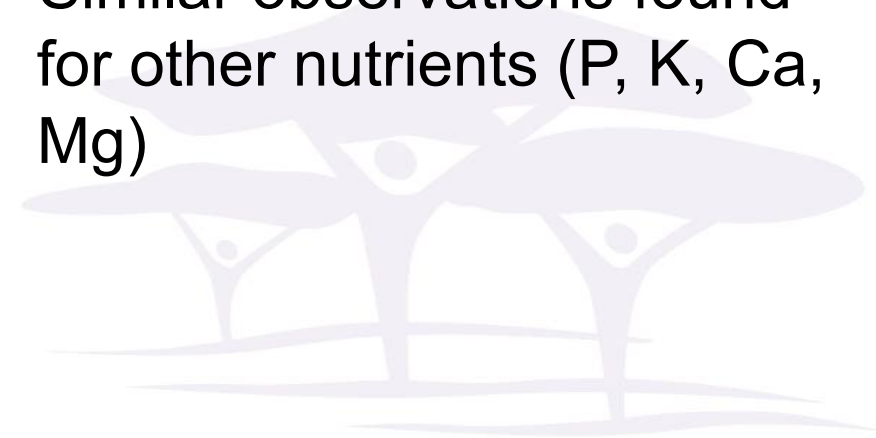


Optimum threshold



## Soil degradation

- Low soil fertility below the optimum for sustainable cocoa production as evidenced here by Soil Organic Carbon and total N
- Similar observations found for other nutrients (P, K, Ca, Mg)

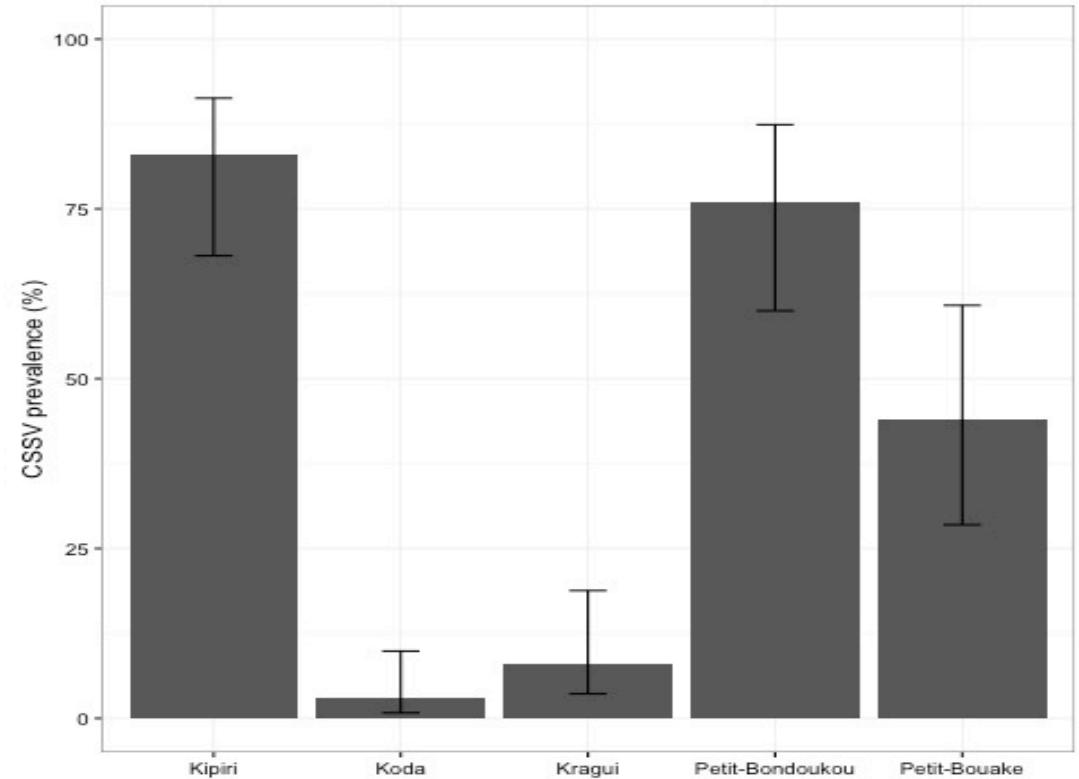


# Ecosystem transformation: Disease outbreak?

## Cocoa Disease Outbreak?



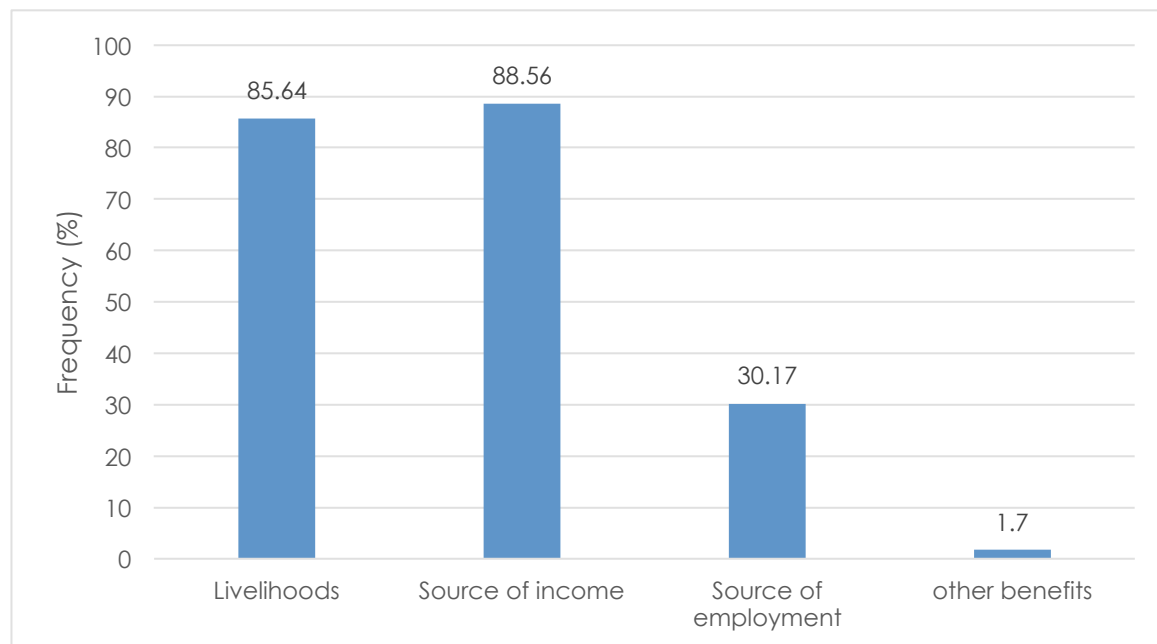
Reports that human diseases such as sleeping sickness and buruli ulcer are mainly triggered by deforestation (personnel communication).



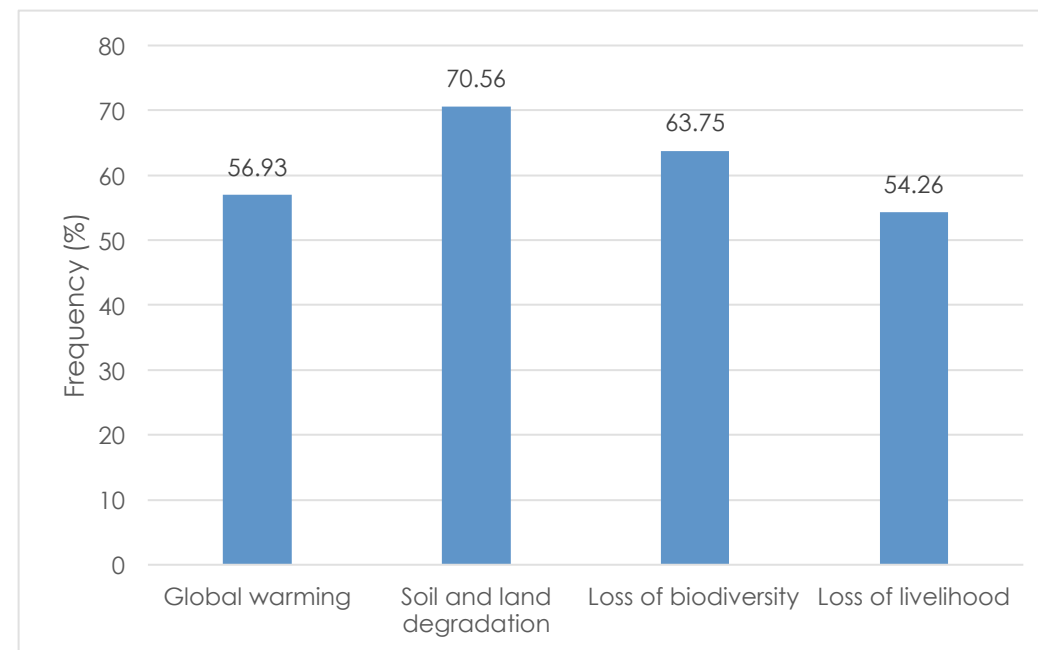
Cocoa Swollen Shoot Virus Disease prevalence in selected sites of the Nawa region



# Ecosystem transformation: Famers' perception

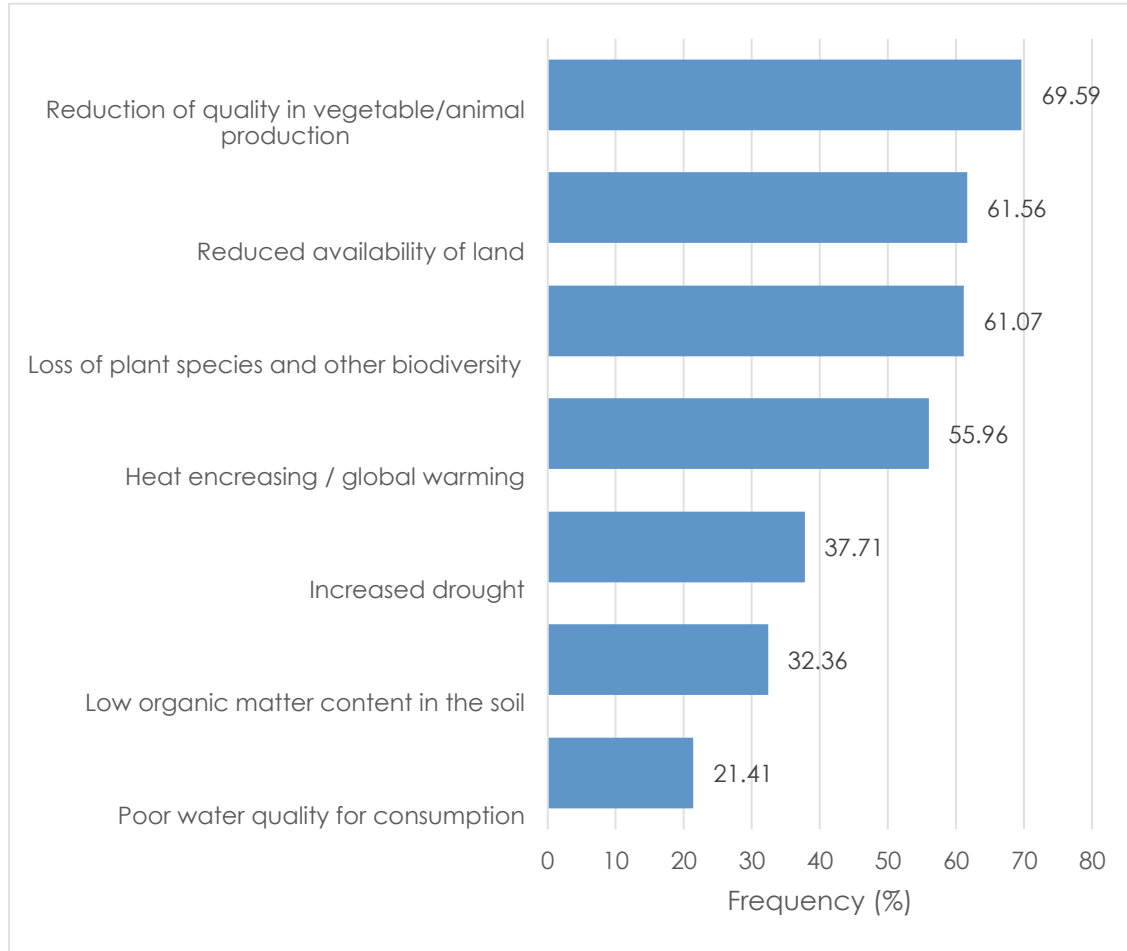


socio-economic benefits of deforestation –  
Perception of farmers

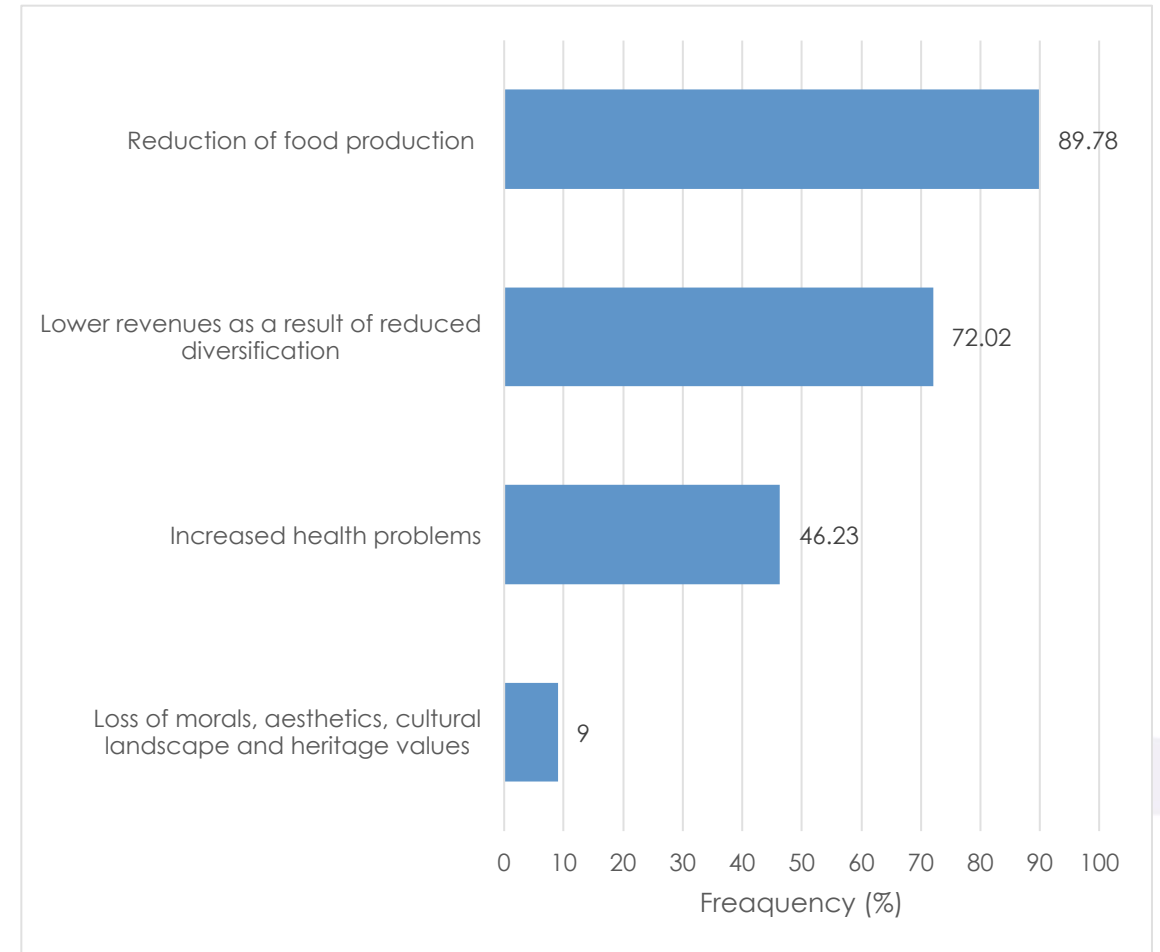


Negative effects of deforestation in the  
community – Perception of farmers

# Ecosystem transformation: Famers' perception



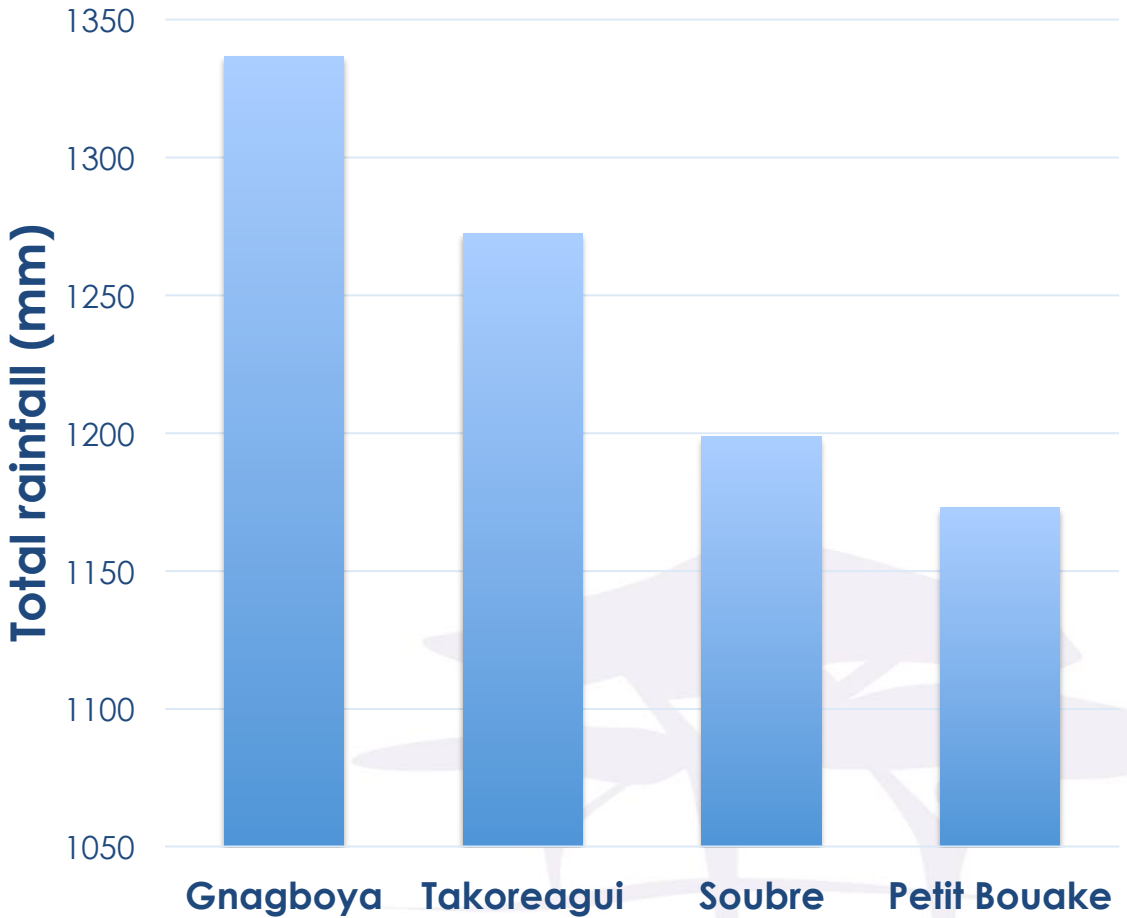
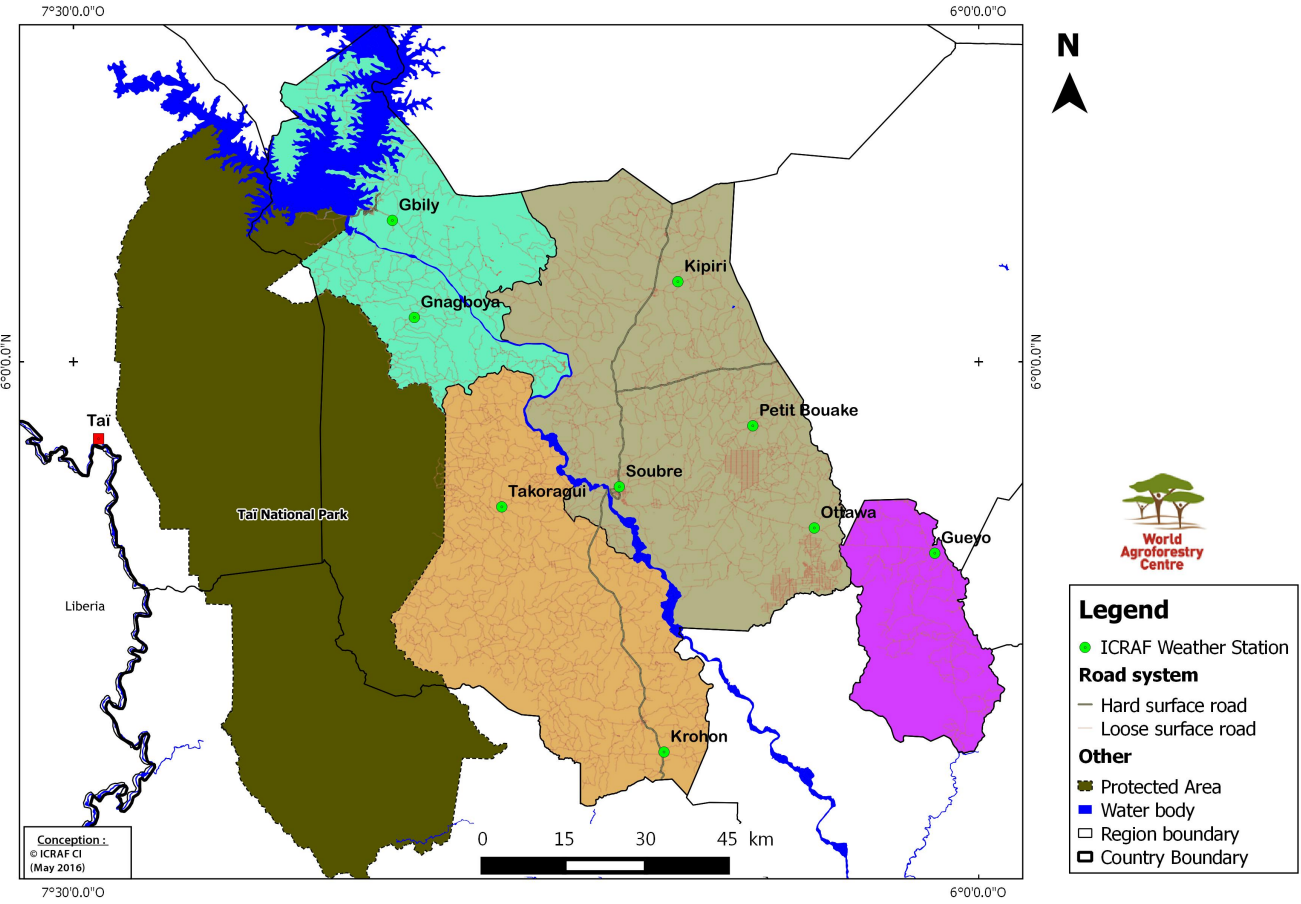
Perception of negative effects of deforestation on the community production activities



Perception of negative effects of deforestation on socio-economic activities



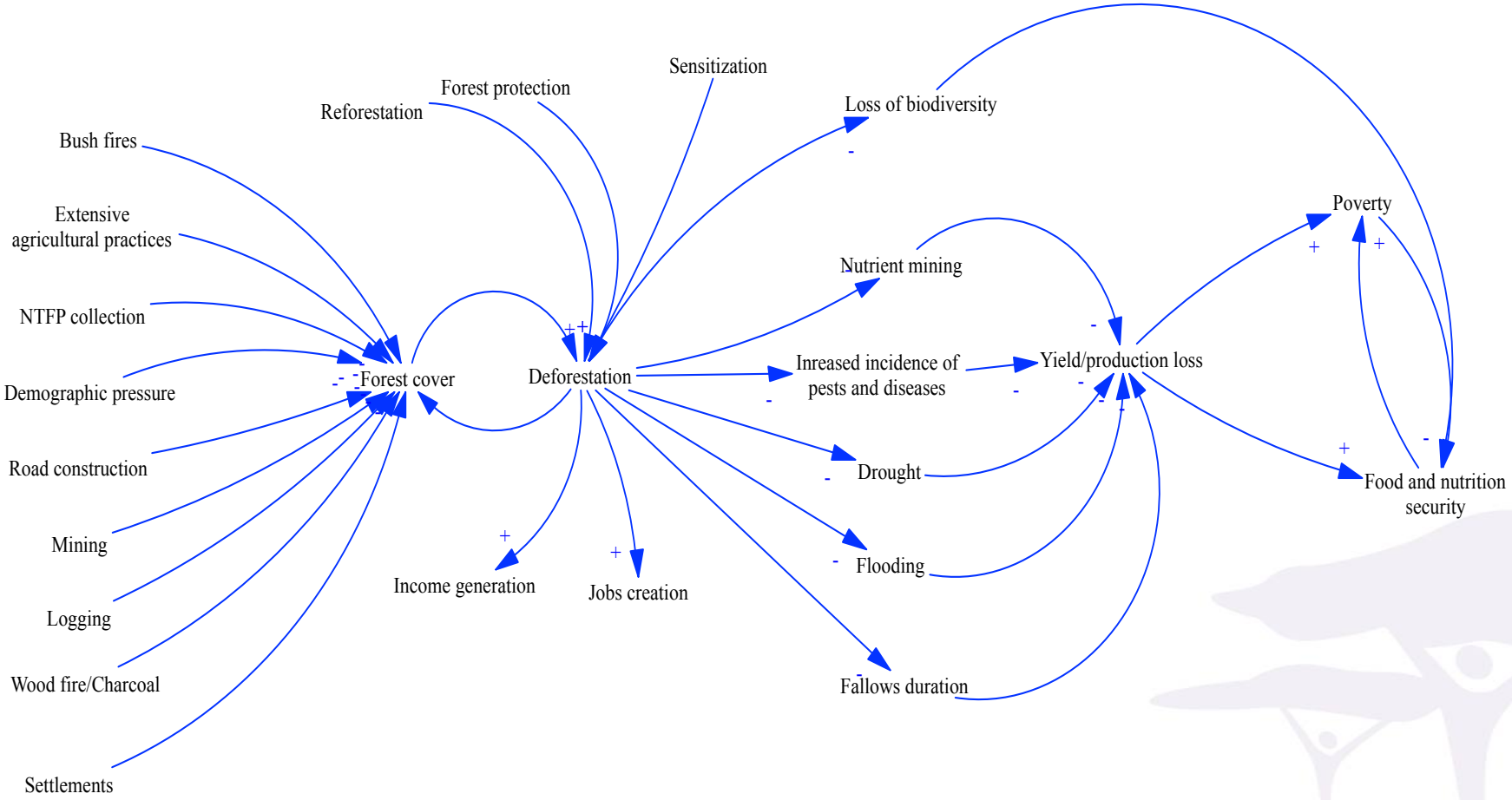
# Ecosystem transformation: rainfall regime



Agrometeo stations in the Nawa region

Rainfalls in selected sites of the Nawa region in 2015

# Conclusion



Simplified causal loop diagram of a model examining the drivers, consequences, control measures and mitigation of deforestation



Thank you



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# Conclusion

- Extensive practices of agriculture are the major driver of deforestation in the areas.
- High pressure of population due to migration towards the cocoa economy.

Other drivers include activities such

- as mining, logging, charcoal; development projects such dam or road construction.
- The insufficient application of the policy contributes also to deforestation.
- Clandestine encroachment into forestland including the protected ones.

While deforestation is thought to contribute to economic growth, it has many adverse consequences including among others low productivity, poverty, and climate change.