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Introduction

Conversion of natural vegetation to other land use types by human activities increases atmospheric CO₂ concentration due to the release of carbon stored in woody biomass, which is the main driver of climate change. The release could also vary by climate zone. This study aims to determine the proportion of carbon lost when natural vegetation are converted to other land use types.

Methods

Vegetation data were collected in 120 plots following climate zones and land use types. Typology of land use was characterized by protected areas (PA), fallows (FL), croplands remaining croplands (CC: >20 old years) and lands recently converted to croplands (LC: <20 old years).



PA



FL



CC



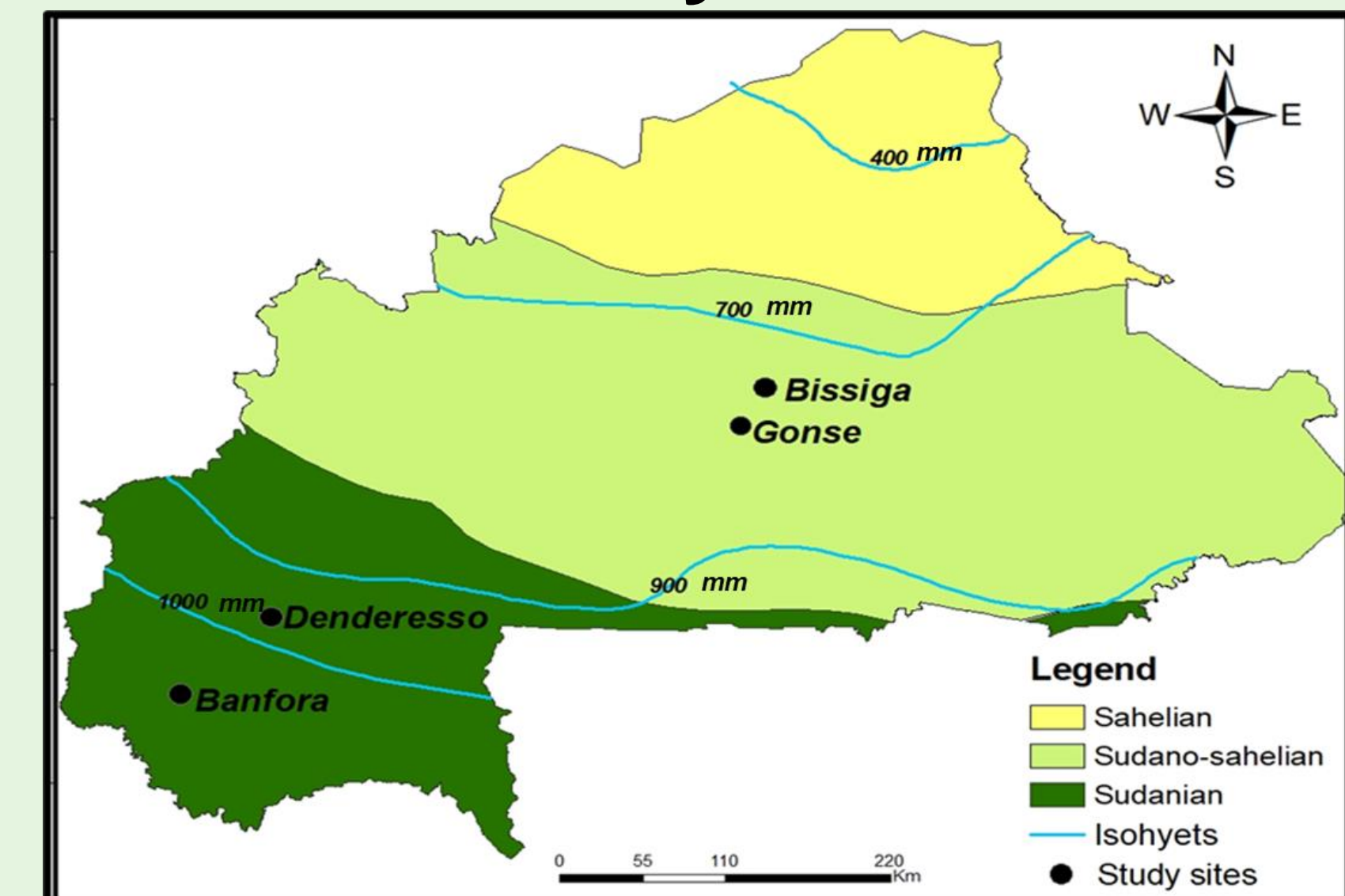
LC

Sampling plots were 2500 m² (50 m x 50 m) for croplands and 1000 m² (50 m x 20 m) for fallows and protected areas. Morphological characteristics of the trees were measured such as diameter at breast height (DBH) and total height (h) of each adult tree. The following formulas were used to estimate biomass and carbon stock :

Parameters	Equations	Authors
Aboveground biomass (AGB)	$AGB = 0.0673 \times (\rho DBH^2 h)^{0.976}$	Chave et al. (2014)
Belowground biomass (BGB)	$BGB = \exp [-1,0587 + 0,8836 \times \ln (AGB)]$	Pearson et al. (2005)
Carbon	$(AGB + BGB) \times 0.47$	IPCC (2006)

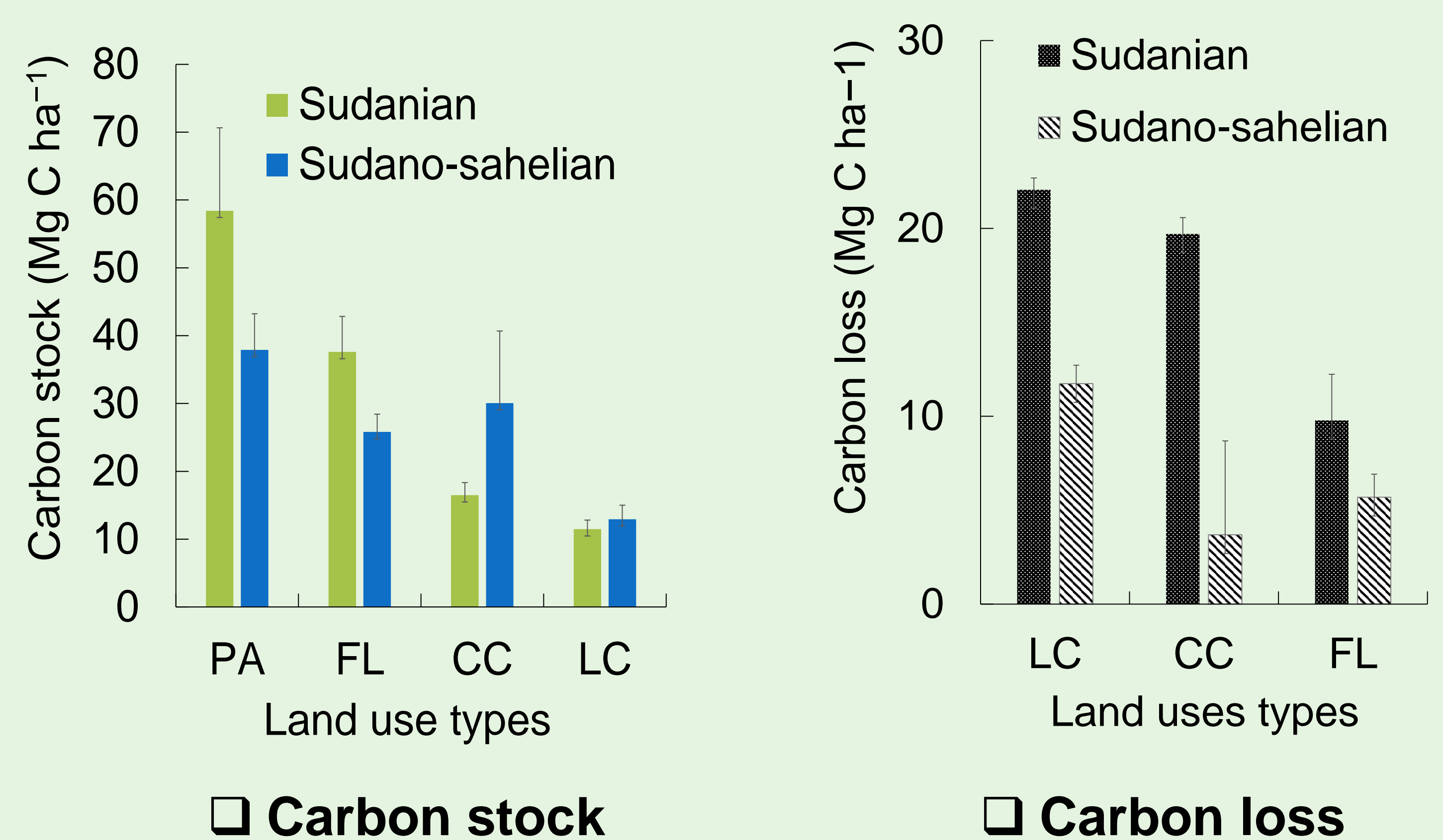
Protected areas were considered as controls to determine carbon loss from natural vegetation conversion to croplands.

Study area



Results

Carbon loss is greater when PA (Control) is converted to LC.



Carbon loss varies by climate zone and land use type.

Comparison of carbon loss

Climate zones	Land uses types	Mean Carbon loss (Mg Ca ha ⁻¹)	P value	Mean global carbon loss (Mg Ca ha ⁻¹)	P value
Sudanian	CL	22.06 ± 0.63 a	0.001	18.11 ± 0.87	0.001
	CC	19.71 ± 0.87 b			
	FL	9.78 ± 2.46 c			
Sudano-sahelian	CL	11.74 ± 0.98 bc	0.32	6.14 ± 1.91	
	CC	3.69 ± 0.5 d			
	FL	5.69 ± 1.23 d			

Conclusion

Carbon loss depends on climate zone and land use type. At least 3.69 ± 0.5 Mg Ca ha⁻¹ is emitted by the conversion of natural vegetation into croplands. Silviculture and assisted natural regeneration should be encouraged in agricultural landscapes to mitigate the effects of land use change.