

Effect of land use systems on soil and vegetation carbon in the Nioro area (Senegal)

Roger BAYALA, Modou SENE, Russel YOST, Richard KABLAN, Justin YATTY, Dethié NDIAYE

roger.bayala@gmail.com (1,3), modousen@refer.sn (1), rsyost@hawaii.edu (2), rak@hawaii.edu (2), yatjust@yahoo.fr (3), dethie@cse.sn (4)



Introduction

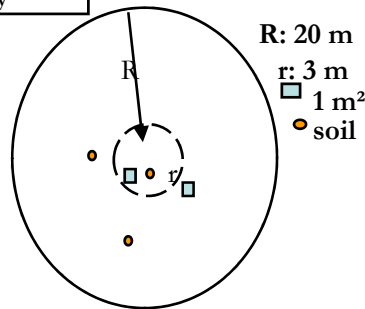
Land use system is a major factor of the evolution of the ecosystems. Abuse natural resources (soil, water, forest) by an incessant increasing demography is the main cause of their degradation. CO₂ emission is the major Greenhouse gas coming from Human being activities. Shrinking carbon in soil and vegetation constitutes not only one effective way to fight against this phenomenon, but also could improve sustainable agriculture in sahelian area. Remote sensing to identify land use systems and evaluate in large scale is useful. In Senegal Carbon sequestration has concerned trials on farm (biomass production and soil). This study carried out carbon sequestration in vegetation and soil in an agro ecosystem scale based on land use systems between years 1990 and 2001.

Objectives

The aim of this study is to determine different types of land use and land cover of Nioro area from Land sat and Spot the images, Evaluate carbon content in soil and vegetation of each type Prediction model of carbon in the same ecosystem

Methodology

- Types of land use and land cover were identified from satellite images
- 54-points soil sampling are collected in relationship with different scenarios
- 3 soil sampling mixed in 2 layers 0-20 cm and 20-40 cm
- Vegetation carbon data set:
 - Shrub height
 - Shrub diameter
 - Grass biomass
- Plant circumference (h= 1.3 m) is measured with measuring tape
- Carbon stock = Biomass x 0.42



Soil and vegetation sampling methods

Results

land use and land cover rate carbon in vegetation and soil per hectare 2001

Land use/land cover	Superficie ha	Rate %	Plant (C t ha ⁻¹)	soil (C t ha ⁻¹)	
				0-20	20-40
Low land	400	0.4	65	3.55	3.03
Fallow	301	0.3	13	1.18	0.77
Plantation	471	0.5	91	2.10	1.70
Cultivated Area	77101	78.0	13	1.32	0.88
Timbered Savanna	875	0.9	32	1.60	1.15
Shrubby Savanna	17456	17.7	21	1.40	0.87
Tannes	2255	2.3	0	0.88	1.56

Land use and land cover rate about of 46000 hectare

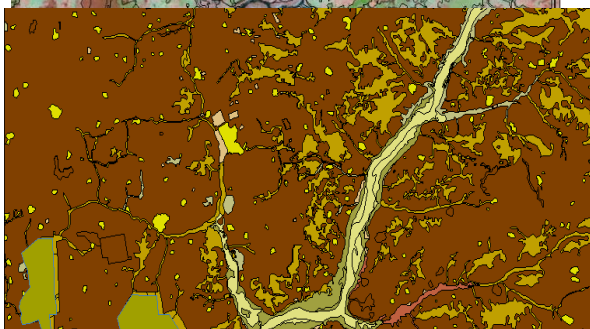
Land use	2001	1990
Water plan	0.02	0.02
Plantation	0.01	0.01
Shrubby Savanna	0.18	0.20
Timbered Savanna	0.02	0.04
Cultivated area	0.75	0.65
Habitat	0.02	0.02
Cultivated area mixed shrub	-	0.05

Estimating variation of land use between 1990 and 2001

Land use	variation %
Plantation	+1
Shrubby Savanna	-12
Timbered Savanna	-59
Cultivated Area	+15



Land sat image 734



Zonep.shp
Zonep_poly.shp
Ocosol_ceras.shp
Forêt galerie
Habitat
Jachères
Plantation
Savane arborée à boisée
Savane arbustive à arborée
Surface en eau
Tannes
Végétation aquatique
Zone de culture

Land use and land cover types in the Nioro area

Conclusion

- Carbon sequestration is most important in biomass in plantation area
- High soil carbon content in low land.
- High lost of timbered savanna
- Older years land use systems requirements