Potential of Moroccan soils to sequester carbon and mitigate the climate changes

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- Forests play an important role in the cycling of greenhouse gases, acting as both a sink and source of these gases.

- In discussions of global warming, it considered that carbon dioxide (CO_2) is the most important of the greenhouse gases.

CO_2 contributes some 58% of the greenhouse effect (Houghton, 2005).

- Carbon is stored in various pools in a forest ecosystem:

above- and below-ground living biomass

(including branches, foliage, roots, litter, woody debris, soil organic matter and forest products.

☛ Until recently, it was admitted that land-use change contributes 25% of current human-induced carbon emissions (Malhi et al., 2002).

☛ A land use change can cause important changes in soil surface horizons C stocks, in the form of reduction or an increase (Schuman and al., 2002).

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☛ The increase of quantities of C stocked in soils has a positive impact on the improvement of the soil quality.

☛ However, this quantity of the C sequestrated depends on several factors of soil management like land use change.

☛ Therefore, it is essential to measure reservoirs of carbon, in order to mitigate the climate change (Tremblay and al., 2002).

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- There are limited data from Morocco and other developing countries on the quantification of carbon reservoirs in response to land use changes.

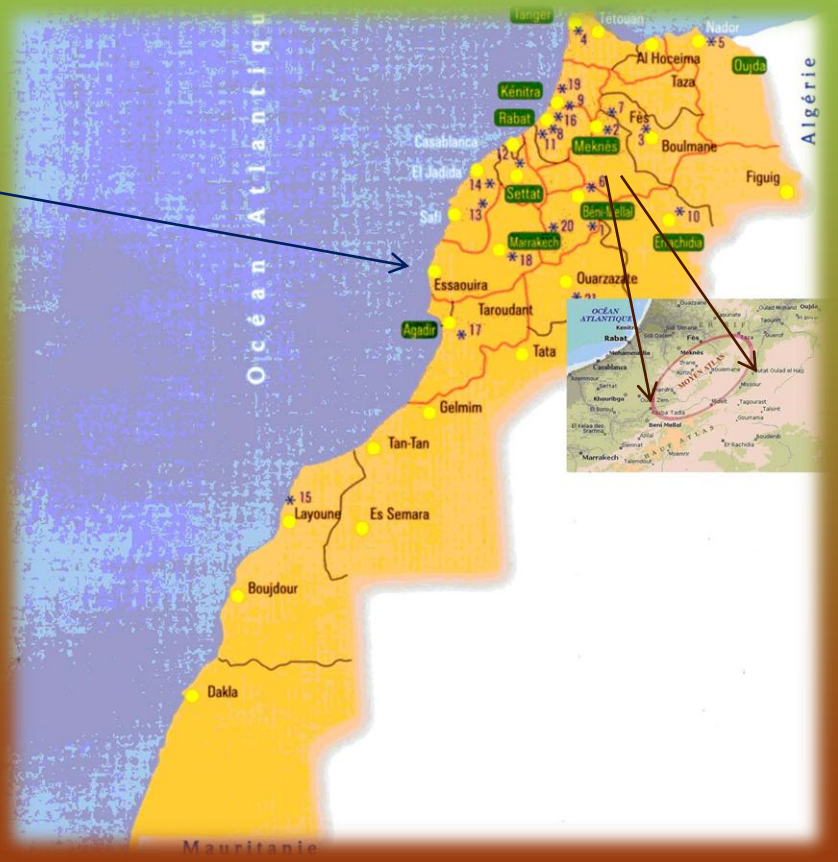
- The objectives of this study were to :

  - ✓ assess the effect of the conversion of natural forests by cultivation and the overgrazing on soil physical quality (bulk density and wet aggregate stability)

  - ✓ estimate the carbon storage in different reservoirs (biomass, necromass and soil) under different land uses.

Materials and methods

1. Experimental Setup



Materials and methods

➢ **The study was undertaken on two sites**

1. Experimental Setup

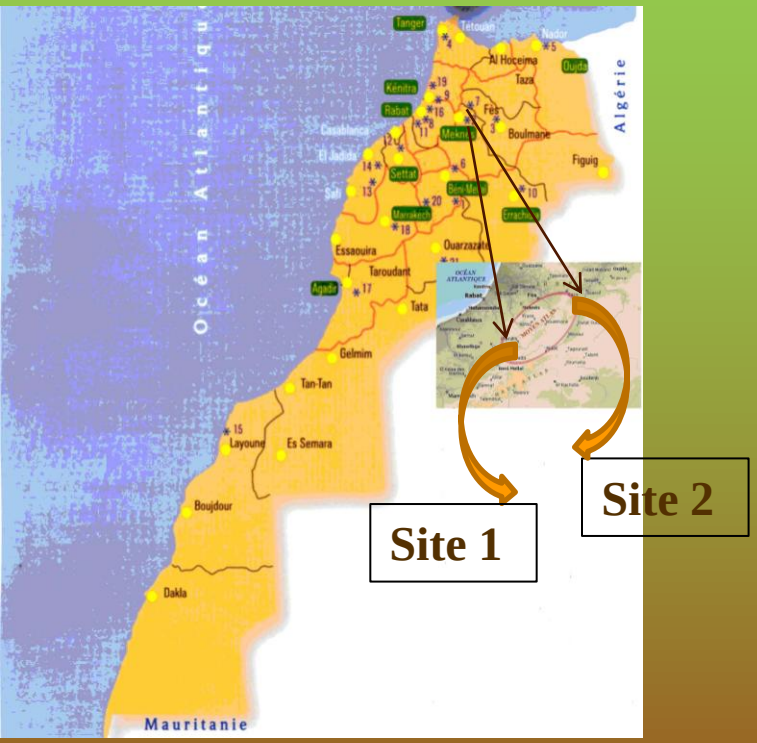
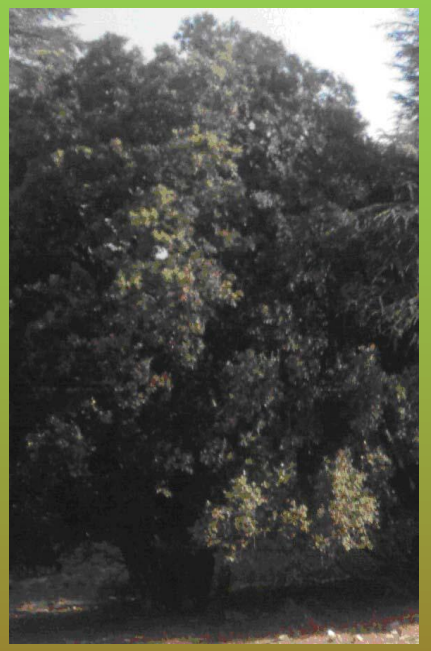


Figure 1. The map showing the study area and population types.

1. Cedrus atlantica (site 1)



2. Quercus rotundifolia (site 2)

➢ **At each site: The soils , Biomass and necromass collected are from the natural forest (N), grazing land (G) and cultivated land (C)**

Average Precipitation= 800 mm/year
T° max = 30 – 40°C
T°min = 0.2 – 4°C

Materials and methods

2. Sampling of the different reservoirs of carbon

☛ Our method of sampling is similar to those described by many authors (MacDicken, 1997, Pearson and Brown, 2005).

☛ Carbon stock was estimated in reservoirs of the biomass (trees, shrubs, herbaceous and roots), in necromass (litter and deadwood), and in soil (Figure 2).

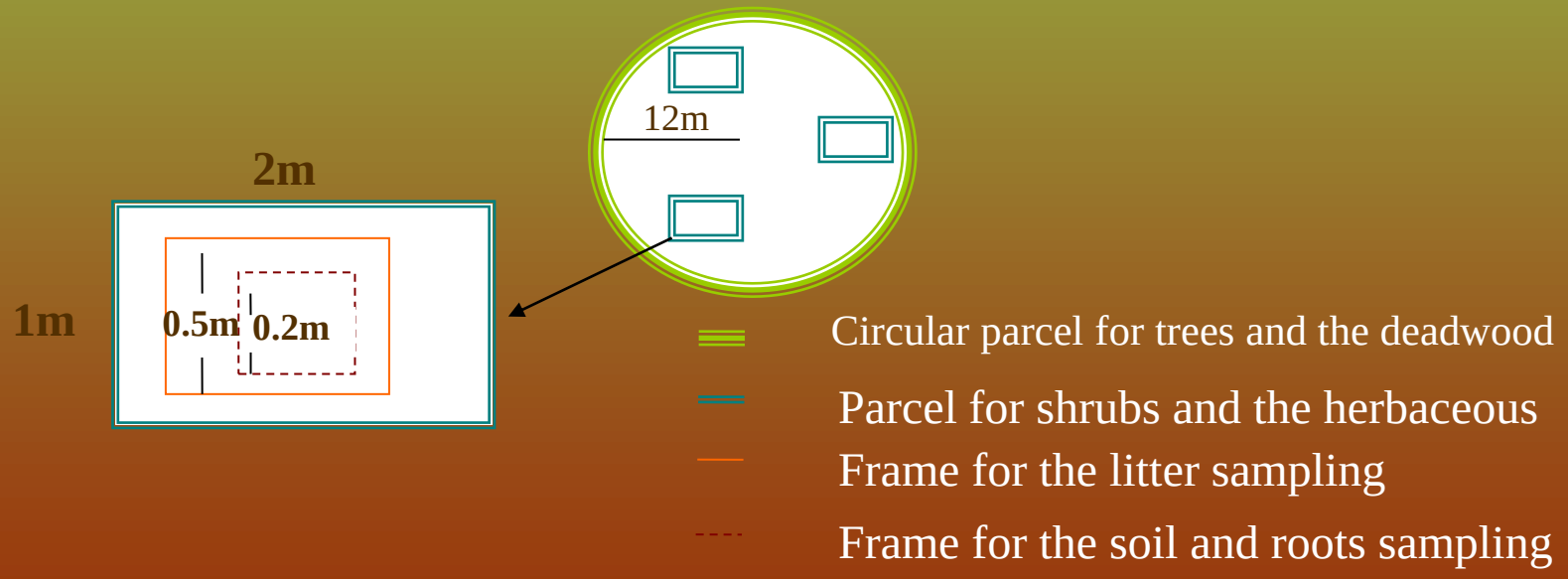


Figure 2. Carbon reservoirs sampling setup.

Materials and methods

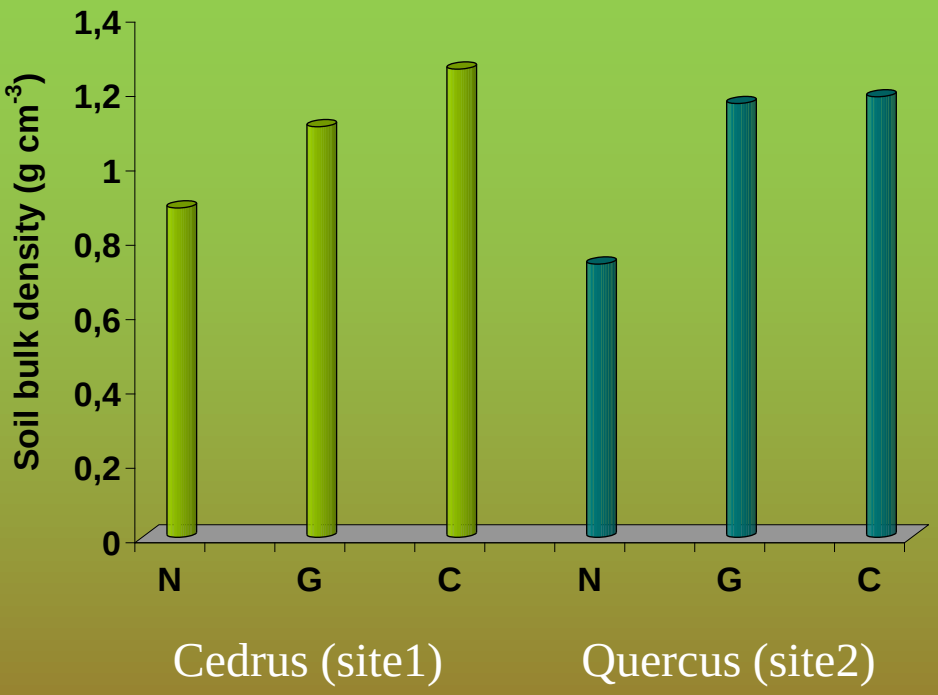
3. Soil physical indicators Measurements

☛ The soil bulk density of each sample was measured according to the Blake and Hartage's method (1986) in the top of 30cm layer of soil in each land use.

☛ The Wet Aggregate Stability (WAS) was measured after following the method of Pojasok and Kay (1990).

Results

1. Soil Bulk Density



N: natural forest
G: grazing land
C: cultivated land

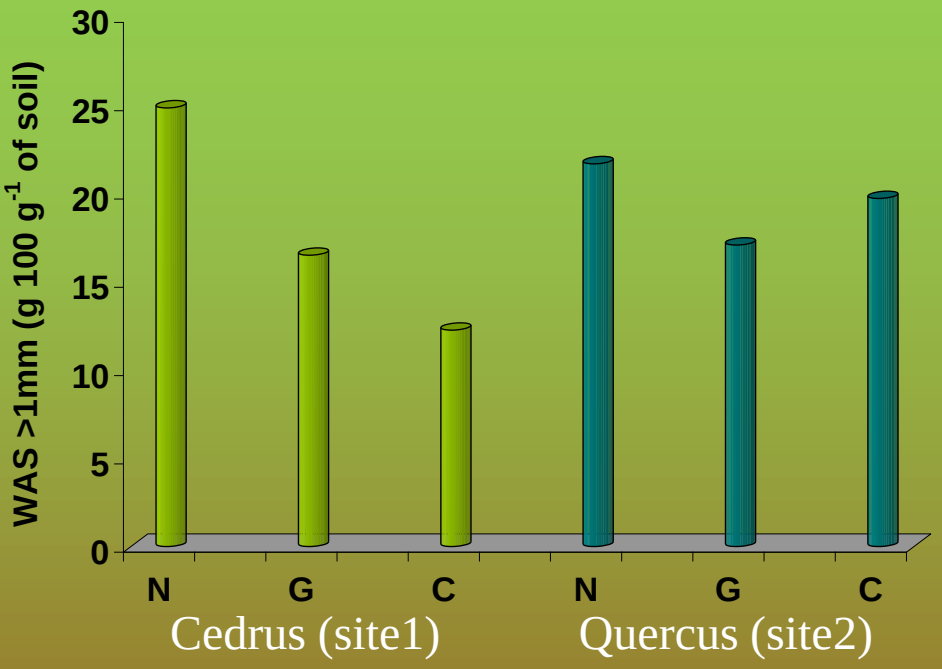
Figure 3. Variation of the soil bulk density with land use changes.

✓ The results showed that the transformation of the Cedrus and Quercus natural forest into grazing land and cultivated land had a significant effect on the compaction of the soil.

✓ The bulk density increased with the degree of the degradation of the ecosystem

Results

2. Wet Aggregate Stability



N: natural forest
G: grazing land
C: cultivated land

Figure 4. The wet aggregate stability > 1 mm under different land use.

✓ The conversion of the forests into cultivated lead to decline in wet aggregates stability > 1 mm to 51 % and 10 % under Cedrus and Quercus, respectively.

Results

2. Carbon stock among the various reservoirs

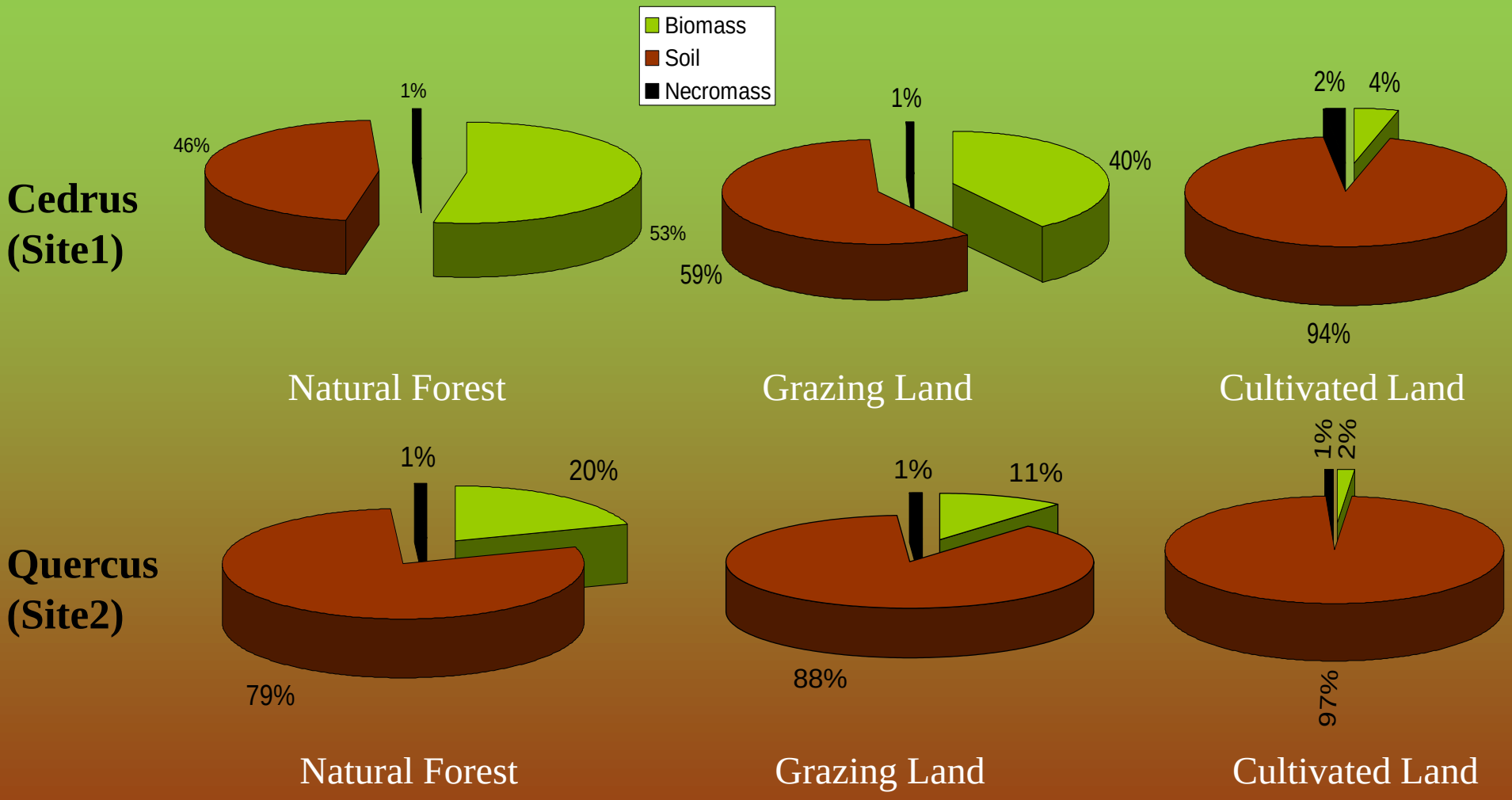


Figure 5. Distribution of carbon stock among the various reservoirs for each land use.

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Results

2. Distribution of carbon stock among the various reservoirs

✓For all land uses studied, the magnitude of carbon stocks among the different reservoirs (biomass, necromass and soil) was biggest in soil

CONCLUSIONS

✓ This study confirmed the harmful effect of land use on the carbon storage.

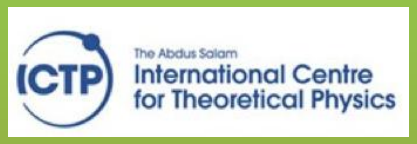
✓ The carbon sequestration decreased with the increase in the degree of forest degradation with overgrazing and cultivation.

✓ The degradation of natural forests by the overgrazing is responsible of 34% and 28% of carbon loss under Cedrus and Quercus, respectively.

✓ The Cedrus forest stocks more carbon in the biomass, necromass and soil than the Quercus forest.

✓ Results support the view that the soil is the biggest reservoir of carbon that could play an important role to mitigate the climate changes.

Acknowledgements



THANK YOU FOR YOUR ATTENTION

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