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Crop Waterstress Management in the Tropics and Subtropics (380c)



RELATIONSHIP BETWEEN VEGETATION TYPE, SOIL TYPE, SOIL MOISTURE AND CARBON STOCKS IN SEMIARID ETHIOPIAN SAVANNAHS

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Abstract

Almost 65% of all pastoral lands in the tropics are in Africa and approximately half of them are dominated by a semi-arid climate. In Ethiopia, 62% of the surface area is pastoral lands. The Borana rangelands cover around 95000 km² in southern Ethiopia. Livestock-based pastoral and agro-pastoral livelihoods are no longer sufficient to sustain food security and living standards for pastoral people, due to rapid population growth, extreme weather events and structural changes. Payment for Environmental Services (PES), based on carbon sequestration under improved livestock and rangeland management could be one way to diversify livelihoods and generate income to the vulnerable pastoralist communities in southern Ethiopia.

To assess the potential of such PES systems, more knowledge about the biophysical potential for carbon sequestration and the environment are required. The main aim of this pilot study was to characterize the study area, located in the southern part of the Oromia region (south Ethiopia), and provide basic data on vegetation types, soil types, soil properties, precipitation pattern, soil moisture content and carbon stocks.

For each of the vegetation types (Grassland, Tree savannah and Bush-Tree savannah), five plots were selected in the 10 x 10 km study area. For each plot the soil type was identified with the help of auger samples. Furthermore, total aboveground biomass and C-stock [t ha⁻¹], total SOC stock [t ha⁻¹] for 1 m depth, SOC concentration [%] and carbonate content [%] in four depths (0-10, 10-30, 30-60, 60-100 cm), and bulk density [g cm⁻³] were examined. At 10 of the 15 plots precipitation measurements [mm] and soil moisture [Vol%] measurements in two depths (0-6 and 30-36 cm) were carried out.

An analysis of variance (ANOVA) was used to describe differences in aboveground C-stocks, SOC stocks, SOC concentrations and soil moisture content depending on vegetation or soil type. It was shown, that except for total aboveground C-stock, the SOC stock for 1 m, SOC concentration and soil moisture content were significantly different (P<0.05) for the soil types but not for the vegetation types. This indicates that soil type has a stronger impact on these parameters than the vegetation type.

The result on C-stocks for the different vegetation types and soil types can help to give some indication on the carbon sequestration potential of this region.

Key words: vegetation type, soil type, soil moisture, C-stock