Departamento de Posgrados

Maestría en Cambio Climático, Agricultura y

Desarrollo Rural Sostenible – MACCARD

Nutrient dynamics in grasslands in a high Andean area in

southern Ecuador

Máster en Cambio Climático, Agricultura y Desarrollo Rural

Sostenible

Autora: Giomara Michelle Cherrez Cherrez

Director: Pablo Geovanny Quichimbo Miguitama

Cuenca, Ecuador 2024

DEDICATION

To those who accompanied me in difficult times, thank you for your support and for believing in me. Thank you for reminding me that, with effort and perseverance, goals and dreams can become reality.

ACKNOWLEDGEMENTS

I would like to thank the project "Nutrient cycling under different vegetation covers in a mountainous area of southern Ecuador" developed at the University of Cuenca and its teachers for allowing me to develop this research.

I thank the Regional Directorate of Drinking Water and Sanitation Management (PROJECT NERO), the Water Fund for the Conservation of the Paute River Basin (FONAPA) and the Universidad Técnica Particular de Loja (UTPL), institutions that finance and collaborate with the Nutrient Cycling project.

I thank the students from the University of Cuenca who supported the project in the field and laboratory work.

I thank my tutor Pablo Quichimbo for his trust and support in the development of this research.

I thank Pablo Borja and Leticia Jimenez for their valuable contributions in the development of this work.

I thank my parents and siblings: Patricia, Omar and Esteban for all their unconditional support.

I thank Adriana, Alberto, Janneth, Vannesa, Ritha, Jessica, Emanuel, Isabel, Lili, Amanda, Jessi and Mateo for their friendship and support.

RESÚMEN

El conocimiento de procesos de ciclado de nutrientes a nivel suelo-planta es crucial para el manejo sustentable de ecosistemas altoandinos. Este estudio estimó las reservas de carbono orgánico, nutrientes del suelo, la dinámica de la producción de biomasa, la descomposición de materia orgánica en pastizales de una zona altoandina del cantón Cuenca, en el sur del Ecuador además de la integración del conocimiento técnico-científico de ciclaje de nutrientes con agro-productores. Se realizó el monitoreo de la producción de hojarasca, su descomposición y el muestreo de suelo. Las muestras fueron analizadas para la determinación de nutrientes. La producción total de hojarasca fue 0.44 ± 0.06 Mg ha^{-1} year^{-1} y el índice de estacionalidad de 0.26. La constante de descomposición fue k=0.006. El stock de SOC y nutrientes fue mayor en la capa mineral que en la orgánica excepto para Zn y Mn. La integración de conocimientos se ejecutó mediante una sistematización de experiencias a partir del diagnóstico y capacitación de agro-productores.

PALABRAS CLAVE

Pastizales, fertilidad del suelo, hojarasca, descomposición de la materia orgánica, retorno de nutrientes

.

ABSTRACT AND KEYWORDS

Knowledge of nutrient cycling processes at the soil-plant level is crucial for the sustainable management of high Andean ecosystems. This study estimated the reserves of organic carbon, soil nutrients, the dynamics of biomass production, decomposition of organic matter in grasslands of a high Andean area of the Cuenca canton, in southern Ecuador, in addition to the integration of technical-scientific knowledge of nutrient cycles with agricultural producers. Monitoring litterfall production, organic matter decomposition and soil sampling were carried out. The samples were analyzed to determine nutrients. The total leaf litter production was 0.44 ± 0.06 Mg ha^{-1}year^{-1} and the seasonality index was 0.26. The decomposition constant was k=0.006. SOC and nutrients stocks were higher in the mineral layer than in the organic layer except for Zn and Mn. The integration of knowledge was carried out through a systematization of experiences based on the diagnosis and training of agricultural producers.

Keywords

Grasslands, soil fertility, litterfall, organic matter decomposition, nutrient return