



FACULTAD DE CIENCIAS AMBIENTALES

ESCUELA PROFESIONAL DE INGENIERÍA AMBIENTAL

**“EFECTOS HIDROLÓGICOS DE LA CONVERSIÓN DE UN BOSQUE
MONTANO TROPICAL A TIERRAS AGRÍCOLAS EN LOS ANDES
CENTRALES DE PERÚ”**

Tesis para optar el título profesional de:

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Presentado por:

José André Noriega Puglisevich (0000-0003-4510-7314)

Asesora:

Karen Ilse Eckhardt Rovalino (0000-0001-6165-6597)

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Miembro: Dra. Llerme Navarro Vásquez
Miembro: Mg. Alfredo Néstor Salinas Castro

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“EFECTOS HIDROLÓGICOS DE LA CONVERSIÓN DE UN BOSQUE MONTANO TROPICAL A TIERRAS AGRÍCOLAS EN LOS ANDES CENTRALES DE PERÚ”

Presentada por la/el estudiante/bachiller:

- **José André Noriega Puglisevich**

Para optar el Título Profesional de Ingeniero Ambiental

Asesorado por: Mg. Karen Ilse Eckhardt Rovalino

Luego de haber evaluado el informe final de tesis y evaluado el desempeño del estudiante de la carrera de Ingeniería Ambiental a en la sustentación, concluyen de manera unánime (X) por mayoría simple () calificar a:

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Dra. Susan Mery Medina Canzio
Presidente



Dr. Ing. Llerme Navarro Vásquez
Miembro 1



Mg. Ing. Alfredo Néstor Salinas Castro
Miembro 2



Mg. Karen Ilse Eckhardt Rovalino
Asesor

Hydrological effects of the conversion of tropical montane forest to agricultural land in the central Andes of Peru.

José André Noriega-Puglisevich^{1*}, Karen Eckhardt¹

¹ Facultad de Ciencias Ambientales, Universidad Científica del Sur, Carretera Panamericana Sur km. 19, Villa El Salvador 15067, Lima, Peru.

*Corresponding author: anpuglisevich@gmail.com

Abstract

Knowledge regarding the effects on hydrological variables generated both by the conversion of forest to agricultural systems and by the natural regeneration of forest due to the abandonment of agricultural areas is still limited. In this research, the hydrological components that characterize the ecosystem service of water supply and water regulation (actual evapotranspiration, surface runoff and groundwater recharge) were calculated in four land cover types (mature montane forest (BMC), natural regenerating secondary forest (BMR), coffee agroforestry systems (AF) and cropland (C)) located in the central Andes of Peru. Results showed the hydrological components calculated in the four land cover types were as follows (% based on precipitation): BMR (41.2%), AF (40.4%), BMC (40%) and C (38%) for annual actual evapotranspiration; C (16.1%), BMC (8.3%), BMR (5.2%) and AF (4.6%) for annual surface runoff; and AF (43%), BMR (41.6%), C (34%) and BMC (31.7%) for annual groundwater recharge. Furthermore, the relation between vegetation structure and the hydrological components calculated in the four land cover types was also evaluated, and the results showed that the reduction of thicker and taller trees would increase surface runoff generation, while the thinner and shorter trees would favor groundwater recharge.

Keywords: land cover change, tropical montane forests, mature forests, secondary forest, coffee agroforestry systems, croplands, water supply, water regulation.

Practitioner Points

- Coffee agroforestry systems and natural regenerating secondary forests offer higher groundwater recharge and lower surface runoff than mature forests.
- Thicker and taller trees have a greater influence on surface runoff generation.
- Thinner and shorter trees favor groundwater recharge.

1. Introduction

Tropical montane forests of the Andes are considered biodiversity hotspots worldwide, since they represent an extremely species-rich system with high rates of endemism, which are threatened by anthropic intervention (Kappelle, 2004). The hydrology of this ecosystem is strongly influenced by the vegetation cover; plants intercept the precipitation that drips to the ground or evaporates from the leaves' surface, consume water through transpiration and shade the soil, thus reducing soil evaporation (Price et al., 2011). In addition, they have an extensive root network that generates porous and filtering soils (Fiquepron et al., 2013), which play an important role in preventing erosion and reducing flooding risk (Price et al., 2011).

In Peru, tropical montane forests represent 11.71% of the national territory and are located on the eastern slopes of the Andes between 600 and 3800 m.a.s.l (Ministerio del Ambiente de Perú, 2019). Due to their geomorphology that presents steep slopes with altitudinal gradients and drastic climatic variations, they are highly vulnerable to climate change (Karmalkar et al., 2008), as well as to anthropogenic pressure that leads to land use and land cover change in the tropical Andes (Armenteras et al., 2011). Previous studies confirm that tropical forests are the main source of new land for