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Expansion of Quinoa Crop (*Chenopodium quinoa* Willd.) and Soil Quality Analysis in the Bolivian Intersalar

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Abstract

The grain of the quinoa was traditionally cultivated by the inhabitants of the Andean region and constituted the principal food of the Incas. It is characterised by its high nutritive value due to its composition and relationship quantity/quality of protein.

The principal production of quinoa is obtained in the highland areas of Bolivia. Traditionally, the quinoa was sown in small quantities and it was used for self-consumption. The location of crops was in hills and slopes, under a manual system management. As a consequence of the growing international demand and rising prices, expansion of the cultivation in the form of intensive monoculture took place, which generated a negative impact on the fragile ecosystems of the altiplano region. In recent years, the production of quinoa increased from 9,000 t y^{-1} in 1970 to more than 30,000 t y^{-1} in 2009.

The present study identifies the quinoa crop evolution in time and space through satellite images of the years 1975, 1990 and 2010 in the Bolivian Intersalar. At the same time, it employs the physical-chemical soil analysis made by the AUTAPO Foundation, in order to perform a detrended corresponse analysis (DECORANA) and a classification analysis using a two way indicator species analysis (TWINSPAN).

A socioeconomic diagnostic was also carried out through interviews and surveys, to determine the impacts generated from the extension of the quinoa cultivation.

The maps generated through satellite images show that between 1975 and 2010, the cultivation of quinoa, increased from 70 % to 300 % on flat surfaces and decreased from 16 % to 32 % on hillsides. Multivariate analysis indicated that the patterns of soil quality are basically determined by Sodic soils. With the socio-economic analysis, it was demonstrated that in the studied community, the increasing income for the quinoa cultivation had impacts on lifestyle's changes, eating habits, and social conflicts over unequal land ownership and monetary income.

Keywords: Bolivian Intersalar, land-use change, soil, sustainable agriculture, quinoa

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