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BRIEF EXTRACT OF THE EUROPEAN UNION TROPANDES PROPOSAL [(1)]

"Fertility Management in The Tropical Andean Mountains: Agroecological Basis for a Sustainable Fallow Agriculture " (Contract ERBIC18-CT98-0263)

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OBJECTIVES

The aims of this project, integrating agronomy, ecology and socio-economy sciences, are: (a) to analyse the agroecological bases of fallow agroecosystems in the tropical Andes, a conservationist management alternative regulating the pressure of use in areas where population is relatively high and which is the basis of subsistence of a numerous rural population mainly in the Central Andes; and (b) for socioeconomical reasons to develop tools allowing to explore the possibilities of improving the current management and evaluate the short - and long - term consequences.

APPROACH AND METHODOLOGY

Field work will be carried out in paramo of Venezuela (wet conditions) and in puna of Bolivia (drier conditions) at three scales of analysis (Figure 1). Both regions are representative of the tropical Andes above an altitude of 3000 m. **At the regional scale**, the spectrum of physical, ecological and demographic factors which share this type of agriculture will be delimited, using spatial information processed by GIS. **At the farm scale**, the agro-ecological and socio-economical determinants of the fallow dynamics will be analysed in order to optimize balance of the fallow-crop periods and evaluate farm management strategies and their effect on economical, food and soil sustainability. **At the agroecosystem scale**, the mechanisms controlling the fast decline of fertility during the potato crop period and the progressive fertility restoration during the fallow period will be analyzed. Based on previous observations in the Venezuelan paramo, this proposal is built on the essential role of soil organic matter (SOM) as key process controlling the decline and restoration of the soil fertility in the Andean mountain fallow systems.

The functional importance of SOM in nutrients availability is the essential difference between the tropical mountain fallow systems and the tropical low land systems giving this proposal its unique value.

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[1] Synthesis elaborated for the Annual Meeting of the Board of CONDESAN , 14-19 November 1999, Merida, Venezuela

The mechanisms investigation will be focused on the nitrogen mobilisation-immobilisation in the SOM and on the **nitrogen cycling** in the soil-plant system. The essential aspects and techniques are: **(a)** quantitative and qualitative analysis of the fallow succession plants, and of the necromass returning annually to the soil, using Near InfRared Spectrometry (NIRS); **(b)** C and N interaction and transfer throughout the SOM pools (microbial biomass, labile and stabilised SOM pools, inorganic N), using **^{14}C and ^{15}N labeled** plant material; **(c)** identification of the source of N taken up by the crop (soil native N and/or fertilizer N) using ^{15}N labeled fertilizer; and **(d)** characterization of SOM linked fertility during the fallow cultivation cycles, using SOM fractionation and the natural ^{15}N and ^{13}C isotopic abundance of the fractions. **Process based models** (fallow production and decomposition sequential models, potato crop and crop residues decomposition models) will be coupled to describe the complementary fallow - crop phases. The process models will be linked to the economical **farm model** in an ecological approach to evaluate different farm management strategies in order to improve the functioning of the fallow agriculture without violating its sustainability.

EXPECTED RESULTS AND IMPORTANCE OF THE PROJECT FOR THE ANDEAN REGION

The first benefice will be the acquisition of necessary knowledge for a **sustainable management of the soil fertility in high tropical Andes**. The optimization of the balance of fallow-crop system, without degrading the natural environment is the essential issue of this program. Another task is, using the database and the model integration, to elaborate simple and **useful tools**, giving to the regional teams the possibility to explore other scenarios and alternatives and to formulate working hypotheses for future promising investigation as: fractionation of inorganic fertilisation, use of organic amendment, favouring successional species. The proposal also has a **training component** by the use of a powerful methodology, offering an attractive opportunity to the teams for developing their basic capabilities and to the young Latin-American scientists to be trained.

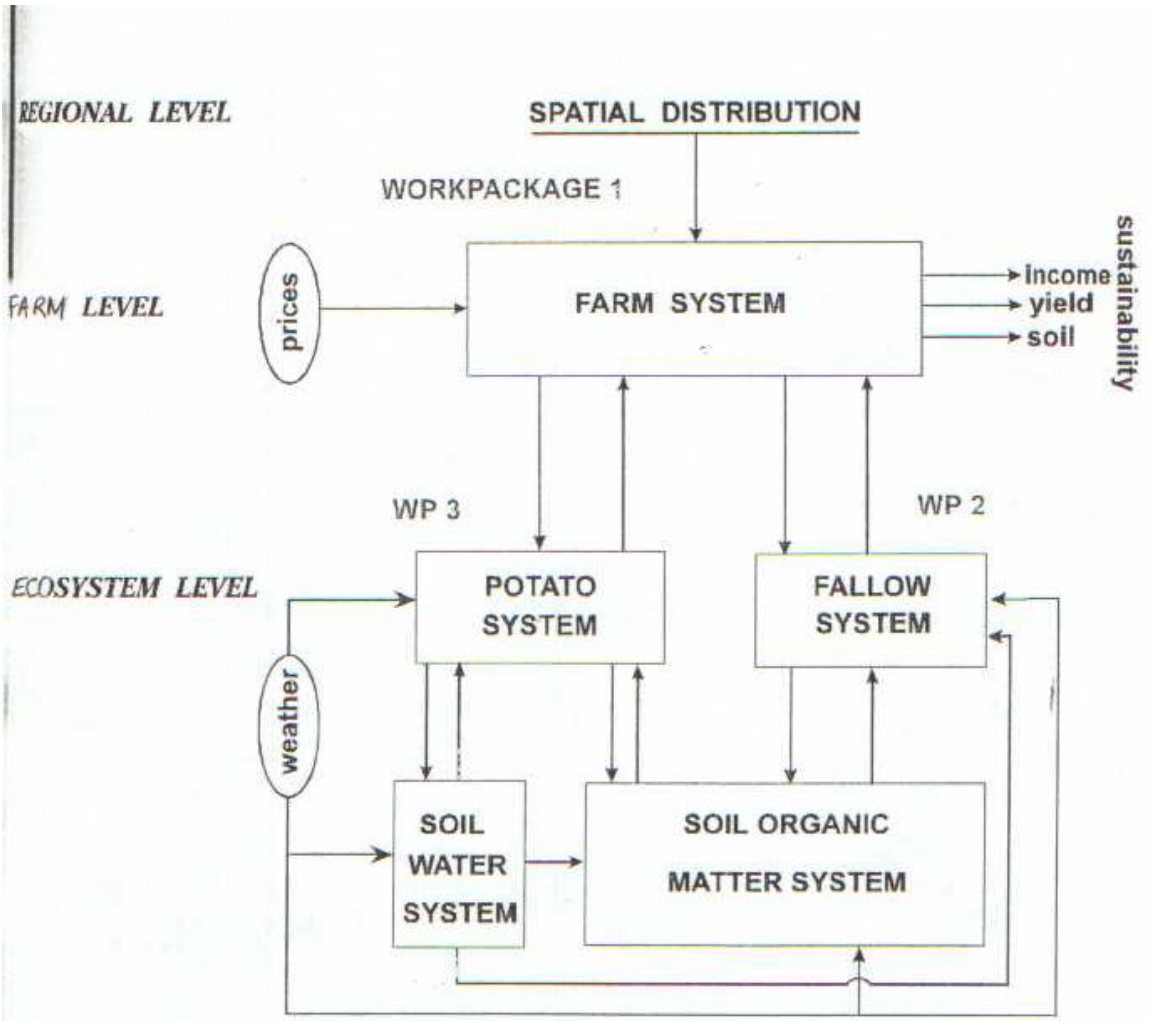

Figure 1. Structure of the project. (WP : workpackage)