1 Introduction

La ciencia se debate hoy entre dos políticas alternativas. Por una parte, seguir siendo la principal herramienta de la economía mundial de mercado orientada por la búsqueda de la ganancia individual y el crecimiento sostenible. Por otra parte, está llamada a producir conocimientos y tecnologías que promuevan la calidad ambiental, el manejo sustentable de los recursos naturales y el bienestar de los pueblos. Para ello será necesario conjugar las aportaciones racionales del conocimiento científico con las reflexiones morales de la tradición humanística abriendo la posibilidad de un nuevo conocimiento donde puedan convivir la razón y la pasión, lo objetivo y lo subjetivo, la verdad y lo bueno. (Leff E.)

The present study of investigation is a contribution to the sustainable handling of soils, from a perspective of interdiscipline between the natural sciences (agriculture, geography, edafology) and the social sciences (sociology, anthropology). The new paradigm of the investigation proceeds from the „*dialogue of knowledge*" as a basis. Thus the scientific and local peasants` knowledge are integrated in this investigation. The latter are the ones who work daily and who elaborate certain concepts, classifications, who use and handle the soil according to their social and historical conditions (Talawar, 1996, Doran, 1990). The soils themselves are the basis of our existence. It is necessary to generate conscience about the need to protect the superior layer of the soil, and this is not only the peasant's responsibility, but one of the whole society in general (State, Universities, NGO's). According to estimations made by the UNEP, every year between 5 and 7 million hectares of soil are lost worldwide, due to soil degradation (FAO, 1996). The contemporary vision points out the soil as dynamic resource, vivid and vital for the production of food, fibre for the global balance, and the function of the ecosystem to sustain life on earth. That is why the quality and health of the soils determine the sustainable agriculture, and despite the capacity of resistance, the soil is finite.

That is why it must be protected and studied as a system which integrates progresses, their dynamics and biological, physical and chemical properties (Feijoo, 1999).

At world level, working on soil quality (ICS), with the agriculturists' help, is a topic which is just starting out and of great importance to propose methods that contribute to the determination of soil quality in a simple, effective and clear way. The indicators of quality and/or fertility of soils should stick to environmental criteria, and the scientists should create politics according to socioeconomic and ecological situations. The prevailing criterion should be the sustainability. (Doran and Safley, 1997).

The present investigation puts emphasis in the local knowledge by the peasants, as a fundamental tool for the soil's sustainability and development. (Winkler Prins and Rhoades 1994 Cited by Rivas). The study has been developed in the watershed of the Río Cabuyal in the department of Cauca, Colombia, where different governmental institutions and independent organizations have been working for more than 30 years. These are the following: Secretaría de Agricultura, Federación Nacional de Cafeteros, Centro Internacional de Agricultura Tropical, ASPROME, CETEC, etc). The majority of these institutions have joined in the Interinstitutional Consortium for Sustainable Agriculture, CIPASLA, who have been pioneers in projects of development and environment protection. Within these projects, the fundamental aim has been to strengthen processes of participation. CIPASLA contributed a lot in the present investigation, with technical and logistic support for the realization of field work during about 10 months of living with the peasants of this watershed.

1.1 Hypothesis and objectives

Initially, the hypothesis, taken into account for the present investigation, are the following:

> "In the oral culture of the peasants, the presence and maintainment of some plants of the wild vegetation serves as indictor for the fertility of soils which are used to esteem the soil's quality."

> "Tools of the technical-scientific culture can be used to attribute physical, chemical and biological properties of the soil to indicating plants."

> " If a system of knowledge between these two islands could be established, we could dispose of use thesse knowledge as indicators of soil degradation."

The general objective of this investigation was: to determine the peasants' knowledge about quality and fertility of soils, with the priority of the weeds as a peasant's indicator of soil quality.

And as specific objectives:

- To evaluate and determine the behaviour of the soil's chemical parameters in the watershed during the last thirty years. Also to evaluate and determine the soil's present state, judging by the soil's analyses of the secretary of agriculture.

- To determine the local system of evaluation of the soil's quality and the principal local indicators of the watershed's soils.

- To differentiate plants which according to local knowledge are indicators of soil quality. To elaborate a toposecuence in the watershed, from the high to the low zone, with the aim of correlating the properties of indicating plants to soil quality.

- To establish a system of correspondence between the two sources of knowledge, the scientific and the local one, to dispose of early indicators of soil quality.

- To regain the agriculturists´ knowledge which procedes from their apprehension and relation with the soil.

Methodologically the research required a stay in the watershed for ten months, for the recollection of field data: The gathering of information concerning the agriculturists´ knowledge, through direct interviews, a survey with 47 rural families and workshops on soil quality. Together with the agriculturists, soil samples were taken from each of their lots, besides visiting the lots to recollect the principal indicating plants (weeds), according to the agriculturists.

1.2. Present state of the Problem

Since 1920, waves of emigrants have begun to turn the mountain forests into property, grass land region and arable soil (Molano, 1992 Cited by Feijoo, 1999), and after 1940, when extending the industrial systems of culture by valleys, the cattle ranch moved towards slopes of Andean mountain ranges, characterized by the high diversity, generating structure of production characterized by the agriculture of the peasantry and extensive systems of young bovines.

The present panorama has not changed; many municipalities suffer from the deterioration of the hydrographic river basins and the deficiency or excess of rainwater that facilitates in this case the natural disasters caused by the hydric erosion. That is why the infiltration has diminished in such a way that during rain periods, in some localities run-off takes place and just a short time after the rains (4-6 days) the symptoms of water deficiency are distinguished (Amézquita and Londoño, 1997).

1.2.1. Impact of the soil in the area of Investigation

The points of departure are the main cultural practices in the climatic conditions of the region. The increase of acidity with the application of acid fertilizers can be appreciated, as well as the loss of cations by leaching and erosion. The increase of acidity, on the other hand, generates the increase of the solubility of aluminum within the soil (considering that the contents of aluminum of volcanic soils are relatively high.) The increase of soluble aluminum, on the other hand, causes an increase of the soil's acidity, reduces the disposal of nutrients and the efficiency of the fertilization, especially of phosphorus.

The investigation of such diversity in Andean mountains makes a possible strategy of investigation at the landscape level difficult to realize; for such reasons it has been preferred to work with the concept of hydrographic river basin, which is defined as complex hierarchic systems, dynamic and of adaptations in which the natural processes and the human activities take place (Knapp et al, 2000). The plan of handling of a hydrographic river basin must be based on a series of technical studies, amongst which the one of soils ranks as well. The aim is to establish precise norms and to obtain the benefits that guarantee the conservation, the sustainability of the production systems and recovery of the natural balance, as well as to

create a global knowledge to generate data bases of fragile resources of the soil. These must be related to the environmental parameters that affect the agroecosystems. Furthermore, this plan is important to stimulate the development of programs or technical itineraries that involve the participation with decision-making character of the communities of agriculturists and their families in the local and regional scope.

Although the study of soil was only a small part of the ethnoscientists larger research agenda, their probing of informants elicited a substantial amount of information on soil -crop and soil-vegetation relationships. Weinstock (1984), as an example, has categorized studies on local soil classification into two groups: studies dealing with the most readily observable physical dimensions of soil (such as texture or color) and those local classification studies based on cultural dimensions. An example of the latter is the symbolic classification into "hot" and "cold", based on the fertility rather than the actually subsurface temperature of a soil. Many such works also concentrated on how local knowledge of land and soil was used in locating shifting cultivation plots based upon indicators like vegetation and morphological features.

Finally, in the era of the summit of Río (1992), concerning the interest in knowledge and local soil handling, the studies have been oriented towards the "utilitarian thing"; that means, while using the local soil knowledge guiding the development of sustainable soil use (Winkler & Prins, und Rhoades, 1994). The assumption that is underneath these studies is that the more appropriate and political technical assistance can be developed with the understanding of how the local populations perceive and use their soils.

In this sense, there have been several attempts to show externally "to the scientist" that categorizations of soil are not locally understandable. The local and scientific classifications contrast, nevertheless, do not answer the question of how the local systems of the classification relate to the real address and earth operation. The studies of local soil classification are - historically and ethnographically based - typically ahead the "cognoscitivo" approaches, while the investigation of earth direction really focuses in the archives of "carried out daily practices" by peasants. Although the systems of soil classification sometimes reflect that the territories of the way are management, while understanding classification only, does not make that necessary and explains or defines the real use. Therefore, a greater challenge is to combine these two aspects. The knowledge and conduct in a more significant ethnopedological context. Before approaching this synthesis, it

is necessary to review what we presently know separately on the “cognoscitivos” aspects and behavior.

In the Colombian Andean zone, agriculture is practiced by producers of limited resources, in property located in slopes with pending forts, characterized by rich acid soils in alofans, with high capacity of phosphorus fixation and prone to severe erosion (Ashby, 1985; Reinning, 1992). The erosive Andean slope atmosphere processes limit the growth of the plants and, with it, the possibilities of sustaining an increasing human population in the region. The high potential erosion of these soils can be attributed more to the high erosive power of the rain (high intensity, with hail in some occasions) than to the erodability of the soil (Rupenthal *et al*., 1996).

In slopes of the North region of the department of the Cauca, the erosion process has led to the almost complete loss of the volcanic ash layer that covered the area before (Suarez, 1982, mentioned by Müller, 1998). The soils of fishermen, in the north of the Department of the Cauca, are characterized as being not adequate for the agriculture technified by its pending forts and high degree of erosion; in addition to its chemical conditions they are little favorable, being extremely acid soils with very low phosphorus contents (Cadavid and Howeler, 1984). The soils of the shown plots for this test have characteristics that seem to agree with the typical ones of the region. That means, in general an acid pH between 4.5 and 5.5 in average) and a poor fertility, with a very low calcium and magnesium content, slightly low content of potassium, a high percentage of aluminum saturation and organic matter and low capacity to retain nutrients (Buitrago, 1999). In general most of these soils present different degrees from degradation and constitute the present basis of the farming activities (Müller, 1992).