ETHNOPEDOLOGY AND FOLK SOIL TAXONOMIES

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Summary

Ethnopedology is the study of how people understand, view, and manage land at different spatial scales. Local soil knowledge can be extensive and complex, and it can encompass spiritual, cognitive, and practical aspects, as is documented since ancient times. The development of scientifically based approaches to understanding, classifying, and managing soils has overshadowed the value of ethnopedology. People recognize land or soil, and their components as a source of life and livelihoods. They classify them to aid communication, and develop optimal land management practices for each specific soil and landscape types.

Folk soil classifications can use multiple criteria for naming soils, mostly soil color and texture, but also assign special names, mainly for soils and landscapes with unique and distinct characteristics. Folk soil knowledge can add insight and value to scientific methods for soil mapping and land-use planning. Local soil knowledge is vanishing, discarded from one generation to the next, leading to a loss of a community's cultural heritage and unique understanding of its land gained over generations. This knowledge has value and is worth conserving.

1. What is Ethnopedology?

1.1. Scope of Ethnopedology

Ethnopedology is a branch of ethnoecology, coined in 1954 by Harold Conlin, as the study of how people understand ecosystems and environments in which they live. Ethnopedology, coined in 1981 by Williams and Ortiz-Solorio, uses the term pedology as its root but has been applied in a much broader context to include how people understand, view, and manage the land at different spatial scales. It is a scientific discipline that encompasses social and natural sciences. From the cultural anthropology perspective one looks at how soils and landscapes are viewed culturally. From the soil science perspective one looks at how soils are valued and managed. Both disciplines look at how soils and land is classified, nominally, descriptively, or hierarchically within their particular perspective.

Specific interests include the study of: (i) local myths and rituals related to soil, (ii) local soil names, (iii) local perception of soil and its spatial distribution, (iv) local knowledge of interaction of soils with other components of a landscape, (v) local land use, management, and conservation practices, and (vi) comparison of indigenous systems of

soil classification and land management with scientific systems, and integration of local soil knowledge into soil surveys and natural resources conservation practices.

The boundaries of ethnopedology as a discipline are still under discussion by some academics. Some view it in very broad terms to include the study of any knowledge about the land and its management, and others view it limited to folk soil classification studies since the term *pedology* is used in soil science to denominate soil genesis, classification and geography research. Among recent ethnopedological studies, the major part deals with local soil and land classifications (57%), and lesser parts with mythology or land use practices. The other point under discussion is whether one should limit the scope of ethnopedology only to existing folk classifications in weakly developed rural areas, i.e. in pre-industrial societies, or also should include documented soil classifications of the past. In the latter case also a question rises if ethnopedology should include "official" classifications of the past, which are much better documented than local classifications. Here are some examples of these documented classifications.

The earliest known soil classification system in the world can be found in the ancient Chinese book *Yugong* (2,500 years B.P.), where soils of China were classified into three categories and nine classes based on soil color, texture and hydrologic features. Elsewhere, proper names were given, for example in Egypt where *kemet* means fertile black alluvial soils, while *deshret* means red desert land. About 3,000 years B.P. different arable soils had also different cost in Egypt, for example "*nemhuna*" soils cost three times more than "*sheta-teni*" soils. Feofrastus, an ancient Greek botanist, described clay, sand, stony, salty, swamp, soft, and hard soils and their relation to plant cover. In Rome, Cato (234-149 years B.C.) in his fundamental book *'De agri cultura'* described a number of soil types: white clay, red clay, mottled earth (*terra cario sam*), and friable dark earth (*terra pulla*). Mid-American civilizations were also known to develop soil classifications: at least 50 terms for various soils were documented for pre-Hispanic Aztec culture.

One should, however, be cautious with these ancient classifications because, though the terms used by priests and government officials were most probably of indigenous origin, the classification itself, its structure (like three categories and nine classes in *Yugong*) were created artificially. In the case of ancient Greece and Rome, philosophers developed their own artificial classifications, though some names were borrowed from folk terminology. These classifications can, therefore, not be regarded as folk ones, and ethnopedology has little in common with these classification systems. However, the study of folk soil classifications in a historical perspective helps in understanding the development of soil knowledge in various cultures and, thus, ancient reports on vernacular soil classifications should be regarded as important sources of ethno-pedological information.

1.2. Philosophical and Ethnological Bases of Vernacular Soil Knowledge

Indigenous soil knowledge has three main components: (i) local beliefs and perception systems, (ii) local cognitive systems, and (iii) local management and conservation systems. In agricultural societies, the soil is one of the most important parts of the

human environment and therefore receives a special attention, since the whole life depends on soil fertility. Any agricultural society has myths and legends, related to soils whereby soil is usually presented as “mother earth”, which gives life to all beings, i.e. soil fertility is stressed as its main characteristic.

A common plot of the myths is that soil fertility originated from the blood of a god or a hero (in some places victims blood was used to maintain soil productivity), or from the sperm of a god (collective masturbation to fertilize the earth was not uncommon), or from a magic device. An interesting example of the latter in a Karelian-Finnish epos *Kalevala*, where a wonderful mill Sampo has been broken, and its pieces distributed over the shores in order to make the soils more fertile. Likewise has land degradation in places been associated with poetic and mythological explanations, e.g. in Mesopotamia where soil salinization was ascribed to the effect of poisoned blood of a terrible dragon, killed by a hero.

Soil knowledge and soil management practices are closely linked in agricultural societies. Unlike special professional activities (like that of priests, smiths or millers), soil use and management is a common activity for all the members of the community and, thus, the knowledge on soil is widely shared among the people. They develop the management and conservation practices together, and also work out a common classification of soils.

Classification is one of the basic human mental activities. The people start classifying objects from early childhood, and keep on doing that for the whole life. Our language itself is rooted in the classification of the world, where each object should have its own name, and to be grouped with similar objects. The most important entities need common classification on the level of a community: a family, a tribe, or the whole ethnic group.

The value of a soil is recognized in most agricultural cultures of the world from spiritual, mythological level down to the practical knowledge. Thus, special names are sometimes developed for identifying soils. These names, on one hand, include soil in the overall picture of the world, and, on the other hand, provide a necessary communication tool, needed for practical purposes. Since agriculture is a common activity of the community, soil terminology constitutes a part of common language, and develops together with the language itself.

Unlike special terminology, used, for example, by smiths, it is not restricted to a closed professional group: that is why sometimes it is difficult to understand local classifications without an overall perception of the language. However, significant difference in soil knowledge can usually be found among the members of a community according to their age, experience, gender and social status. Thus, this knowledge may be regarded as a collective wisdom of the community.

Though soil serves not only for agriculture, the most extensive soil knowledge is found in agricultural societies. Soil knowledge among nomads and hunters is much more general and their perception of a soil encompasses much larger management units.

2. History of Ethnopedology

2.1. Early Studies of Vernacular Soil Knowledge

The study of folk soil knowledge started in the pre-scientific period, and historical documents show that even in ancient societies the governors and priests collected information on soil resources, fulfilling a kind of ethno-pedological survey. Little documentation of folk soil knowledge occurred in post-Renaissance Europe. To some extent it was due to a general tendency of European scientists to disregard or discredit folk knowledge. This may have been also because soil knowledge was closely connected with pre-Christian agrarian beliefs, which were not approved by the Church.

Later, for a long period up to the 20th century the general situation with folk soil knowledge might be characterized as indifference. In Europe, scientific research of soil as a source of food started in 18th century due to the growth of population and increasing demand for agricultural production. At that epoch the traditional methods of land management were to a great extent exhausted, and future development was related with novel technologies, like deep plowing and the use of fertilizers. Traditional knowledge was considered to be useless, since it could not provide further growth, and the peasants were regarded "ignorant". The same was true for newly colonized territories in Asia, America, and Africa: local agrarian traditions were regarded as imprecise, "primitive", and were even seen as opposed to scientific knowledge.

In places, mainly in the regions with lesser economic development, folk knowledge was however still appreciated. In Russia, a systematic survey of folk soil knowledge was started in the 16th century, when special books were created to evaluate soil resources of the state; these books were prepared by interviewing the peasants about the quality and productivity of their lands. These books mainly included short characteristics of soils, like *poor sandy soils, clayey or stony soils, fat loams* etc. Later, in 19th century, the survey became more regular, and perennial data were published in a series of books "Materials on Statistics of Russia", where a number of local folk soil names were listed. These materials were also used for preparing the first soil maps of Russia which, in fact, were mainly based on an ethno-pedological survey. Also, in India and Africa, British and French researchers paid attention to soil knowledge of local population, but the research was done mostly from an ethnographic point of view.

2.2. Recent Developments in Ethnopedology

In 20th century, the interest to indigenous soil knowledge increased. Most authors consider the seminal paper of Conklin on shifting agriculture in the tropics to be an important milestone of ethno-pedological and ethno-agrarian science. In fact, it was not the first paper devoted to ethnopedology: a number of research works had already been published on vernacular soil knowledge in East Africa, Bulgaria, New Zealand and Russia before that period. However, it was the first time scientists understood that local traditional soil management practices, having been blamed to be primitive and even destructive, were much better fitted to local conditions than the methods developed by trained agronomists.

The increased interest to ethnopedology was inspired by the growing understanding of the importance of soil conservation, land-protective and environment-friendly management practices. Local soil knowledge appeared to be a valuable source of information for land management planning, especially in developing countries. Also, in the 20th century the value of cultural diversity was recognized, and soil knowledge was also appreciated as a part of this cultural heritage. Special attention was paid to indigenous soil terminology.

Many internationally recognized soil names, such as *chernozem*, *solonetz*, *solonchak*, *rendzina*, *terra rossa*, and many others were derived from folk terminology of European peasants. Also, for soils of newly investigated territories some researchers proposed using local vernacular names rather than applying the terms similar to already known soil objects. Although the suggestion was not approved by the soil science community, this example shows the interest of pedologists to folk soil knowledge. The attention to ethnopedology was increasing during the whole 20th century. To the beginning of the third millennium more than a thousand of ethno-pedological papers and reports have been published.

3. Indigenous Soil Classifications

3.1. Aims and Purposes of Folk Soil Classifications

Three main branches currently exist in ethnopedology: the study of indigenous land management and conservation practices, the research on soil-related myths, and vernacular soil classifications. The first branch is a practical discipline, which helps planning optimal land use, the second one is aimed at better understanding of the cultural system of an ethnic group, and the third one constitutes the nucleus of ethnopedology in the strict sense. The classifications of lands and soils do not only exist for fun, but fulfill certain functions in human societies. The aim of most indigenous soil classifications is to provide a basis for land use; however, a number of other objectives exist.

3.1.1. Agricultural Classifications

Land users classify soils according to their agricultural productivity and suitability for certain crops. However, this does not mean that soil names themselves reflect the productivity of soils: most indigenous classifications use internal soil attributes, but peasants know well the correspondence between certain soils and their crop productivity. In Bulgaria, productive soils are called *korava*; soils where crops ripen earlier are identified as *barzitsa*; those that are easy to cultivate are *tatliya*, *halva* or *ryadka*; those that are difficult for cultivation are *stigmata*, *aurtoprak* or *usuka*; the unsuitable ones for cultivation are *muhlevina*; those easily deflated by wind are named *studena*.

In Turkmenia, the most productive soils are named *kara-upa* (*kara* means 'black'), less productive soils *charchin*, salt-affected, but still productive soils are *dzhaksy-kebir*, and completely infertile saline soils are *dzhaman-kebir*. At Trobrian island in Papua-New

Guinea, *kwala* is a productive black soil, suitable for all crops; *sawewo* are soils formed on coral reefs, suitable for yams; *dumya* is a clayey bog soil, suitable for taro in dry season, but unsuitable for yams; *malala* is a poor sandy soil, unsuitable for taro, but suitable for yams.

The examples above show that farmers know a rather wide complex of properties associated with each soil, including their productivity, suitable crops, time of ripening, and resistance to wind and water erosion. This knowledge serves as an important basis for decision-making in land management in every rural community.

3.1.2. Landscape Classifications

In non-agricultural societies, among hunters and nomads, soil knowledge is usually more general than in agricultural societies. For people who do not use soil as a mean of livelihood it has minor importance. However, in places one can find very interesting observations on soil-landscape relations under non-agricultural conditions. For example, Evenks in Eastern Siberia call *kudu* a salted soil (solonchak), used by animals as a source of salt.

In the Ural mountain region people call *aray* low flooded meadow land, covered with harsh unproductive grasses with rare trees of *Alnus* and *Salix* species. In Finland a classification of forested wetlands includes *neva*, being forestless *Sphagnum* bogs on peat ombrotrophic soils; *letti*, being open bogs with grass vegetation on peat-mud-carbonaceous soils; *korni*, being forest bogs with a dense tree growth of birch or spruce on soils with shallow mineratrophic peat layer; and *turvekangas*: dry forested peaty massifs on mineral soils with shallow peat layer.

In Middle Asia, people distinguish *akkum*, literally «white sands», as loose sands without vegetation, and *karakum*, literally «black sands», as fixed sandy soils with a fragmental turf layer on the surface.

In Northern Africa, different types of deserts are distinguished: *erg* – a sandy desert, usually situated in a vast depression; *feh* – a soil of the clayey-stony or sandy deserts; *regh* – a stony gravel desert; *serir* – a stony desert of lowland regions in the Sahara, where the surface is covered with gravel of dense rocks over a compressed sand or sandstone layer; *shott* – saline soils (solonchaks) of closed depressions, with a bottom covered with a loose layer of salts, turning into salted lake after rain.

In Eastern Africa *miombo* soils characterize the dry upland savanna landscape with scarce xerophytic vegetation of southern Tanzania, southern Congo, Angola, Zambia, Zimbabwe and Malawi.

Agrarian societies also consider landscape criteria for soil classification, since the nature of soils in a landscape also affects their productivity. For example, the term *solod*, actually used in some scientific classifications for naming soils with excessive surface humidity and residual salt accumulation, initially meant in folk terminology in Southern Russia “circular wet depressions with arboreal and shrub vegetation”. In Bulgaria, soils

formed on upland positions, where crops die in dry and hot periods, are called *prigor* or *priplavniva*. In Senegal, in Peul language there are special names of alluvial soils, based on the periods of flooding, such as *baldiol:* periodically flooded cultivated clayey soils along drains; *changoul*: silty alluvial soils, periodically flooded by river waters for a short period of time; and *wallere*: silty alluvial seldom flooded soil. Thus, the relation between landscape elements and soil is also well known to the rural communities.

3.1.3. Multiple- Purpose Classifications

People use soil not only for agriculture, but also as a source of construction materials, as painting, for medical purposes, and even for food. Yoruba people (Nigeria) call *ile gamo* a silver-grey clayey soil, rich in residues of mica shales; this soil is considered by the local population as unsuitable for agriculture, but is used as a cementing material.

The Indian name *rakar* more or less corresponds to the concept of *laterite* soils, which were named in that way (*laterus* means brick in Latin) because the local population used these strongly weathered cemented soils as construction materials. In Central Mexico, cemented layers of volcanic soils, called *tepetates*, are also used as bricks and blocks for construction, even for actual urban construction.

Worldwide, from the Russian plains to the Peruvian Andes, clayey soils are used for manufacturing bricks, both in pure state and mixed with organic materials (straw). Special attention is often paid to soil materials for pottery: *loiза de barro* in the state of Paraиba, Brazil, is just one of the examples. Soils are also classified in certain cultures, because they serve as painting materials. In Bulgaria, the name *kulesta* defines soils used as ochre.

Baruya people in Papua-New Guinea classify some soil according to their agronomic value, and the others – based on their significance as body and shield painting: *cheragwaka* is a red ochre soil material (sometimes some treatment is necessary, like burning, to obtain the needed pigment), which is used for depicting the bodies of girls after their first menstruations, women after child-birth, and for initiation of witch doctors; *biwaka* – greenish-grey soil material, collected by the indigenous population in marshy places, which is used for painting sick parts of the body (because evil spirits cannot see greenish colors); *dawaka* – light-yellowish-brown soil material, turning white after burning or drying, includes the material of some anthills, which is used by women for coloring string; *eogwaka* – red-colored clay, which is used by the indigenous population as a pigment for the body of children and on the third stage of initiation; *gwegwaka* – light-grey clay, which is used by the indigenous population on some stages of initiation, and as shield and body in time of war; *ikulukwaka* – a «strawberry-pink» clay used by the indigenous population as a pigment for body in various ceremonies; *numbuchukwaka* – red clay, which is used by the indigenous population as a body pigment at dances and initiation and for war-paint.

Finally, some soils are eatable: Quechua people in Southern Peru distinguish *q'ulp'a* – a special type of soils, most probably containing smectitic clays, used as food by local population; that soil is used as an adsorbent for phytotoxins abundant in local food.

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Biographical Sketch

Pavel Krasilnikov received his Ph.D. at the Faculty of Soil Science of Moscow State University. He worked as a head of the laboratory of Soil Ecology and Soil Geography in the Institute of Biology of Karelian Research Center of Russian Academy of Sciences. He is a Full Professor of the Faculty of Sciences of the National Autonomous University of Mexico. Currently he is a research officer in Teagasc, Ireland. He has more than 100 scientific publications, mainly in the area of soil genesis, geography, and classification. He published several papers on ethnopedology, organized session on folk soil classifications at the International Conference "Soil Classification 2004" and at the World Congress of Soil Science (Philadelphia, 2006). Elected vice-chair of the Commission "Soil Classification" of the International Union of Soil Sciences.

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