The Implication of Folk Soil Taxonomies for Agricultural Change in Middle America

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ABSTRACT
Studies of folk perception and use of soil are part of a growing body of "ethnoscience" literature. Geographer Barbara Williams has pioneered the study of "ethnopedology" in Middle America through her research on contemporary and late Aztec soil classification in the Mexican Highlands. Research in the 1980s, including that undertaken by the author, has extended the study of ethnopedology to other indigenous language and Spanish-speaking areas of Middle America. Recent findings in ethnopedologically oriented research are reviewed in this paper. Particular attention is given to recent findings among Yucatec Maya, Kekchi Maya, Lacondón Maya and Spanish-speaking agriculturalists in tropical lowland areas of Mexico, Guatemala and Belize. Folk soil taxonomies among both indigenous populations and transplanted agricultural colonists are seen as indicators of the relative stability and adaptive success of peasant farming systems.

INTRODUCTION

Ethnopedology is a field of study that has been formally applied in Middle America only in the past decade. Only a few individuals, let alone geographers, have engaged in ethnopedological research. Nevertheless, this research has important applications to contemporary agricultural studies. Studies of folk perception and use of soil are part of a growing body of "ethnoscience" -- including ethnogeographic -- literature. Most ethnoscientific research on folk taxonomies has sought to reveal the taxonomic structure of folk perceptions of the biological world (Berlin, Breedlove and Raven 1973; Hunn 1977). As a basic component of both the biosphere and subsistence systems, soils and folk soil taxonomies are critical elements in traditional agriculture.

Geographer Barbara Williams has pioneered the study of ethnopedology in Middle America through her research on contemporary and late Aztec soil classification in the Valley of Mexico (e.g., Williams 1982; Williams and Harvey 1988; Williams and Ortiz-Solorio 1981). Among other findings, Williams discovered that Nahua speakers in Late Aztec times employed a highly complex soil classification system -- consistent with the complexity of their agricultural system. During the agronometric transformations of the Colonial period, soil classification was concomitantly simplified. This simplification was intensified as Nahua gave way to Spanish speech. The implications of this change go far beyond the description of soil variability; it represents the loss of environmentally adaptive agricultural knowledge.

Williams found that Spanish-speaking peasant farmers in Tepetlaoztoc made only three basic distinctions among arable soils: *tierra negra*, *tierra amarilla*, and *tierra arenosa*. It should be noted, however, that the meaning of these terms is far more profound than the color or texture that their names imply. As in other folk soil taxonomies, the Tepetlaoztoc *taxa* distinguish to their users variations among soils in agricultural suitability. (Osunade 1988). Among other Spanish-speaking peasants of the Middle American highlands, similar "simplified" soil taxonomies are typical (Williams and Ortiz-Solorio 1981). Although not particularly complex, such taxonomies are environmentally sensitive; for example, distinctions are made among several variants of

clayey andosols in the western highlands of Guatemala (Stadelman 1940: 103-4; Wilken 1977, 1987). Nevertheless, these taxonomies are generally much simpler; that is, environmentally less sensitive, than those used by most agriculturalists speaking indigenous languages. Much of the remainder of this paper will summarize some research findings among Maya language speakers of the tropical lowlands of Mexico, Guatemala and Belize. For further discussion of folk soil studies among highland peasants, the reader is referred to the works of Williams and Wilken cited previously.

In the late 1980s, Dunning's work with Yucatec Maya speakers of the Puuc region of Yucatan and Campeche states in Mexico revealed a highly complex folk soil taxonomy that includes seven principal arable land *taxa*, with at least ten subordinate (modifying) *taxa* (Dunning 1990). Soil distinctions were highly consistent among 48 informants questioned about the soils used for both *milpa* and *solar* agriculture. Variations in pedogenesis among **[end p. 243]** the seven basic soil *taxa* are the result of local topographic and drainage characteristics. The seven basic folk soil *taxa* of the Puuc are outlined below as an example of kinds of distinctions in a Maya language soil taxonomy. These *taxa*> are listed with their equivalent classifications in Table 1.

Ekluum, "black/dark soil," is uniformly assigned the attributes of high organic content, clayey texture, firmness, good moisture retention and (of course) very dark, grey-brown color. *Pusluum*, "dry, soft soil," is also fairly dark in color, but is distinguished by its siltier texture, looser structure, good drainage and pliable nature. *Yaxhom*, "greenish, low-lying" soil, is considered to be similar to Ekluum, but is distinguished by its somewhat olive hue, poorer drainage and gummy consistency when wet. Of the seven basic *taxa*, *yaxhom* is the only one which may be of relatively modern origin, or whose use has been spatially so restricted that it has been consistently missed by dictionary compilers for four hundred years (Alvarez 1980; Dunning 1990). Another low-lying, heavy clay soil is *kancab*, "red-yellow soil." It is uniformly described as heavy, sticky when wet, firm and capable of holding a great deal of moisture. *Chacluum*, "red earth," on the other hand, is a shallow, siltier, more loosely structured, deep red and organic soil found in hillslope pockets. It is distinguished from *kaccab*, "high-lying soil," which occurs in breaks on open slopes, and generally has a dark red-brown color. *Tzekel*, "stony" soil, is also a hillside soil, but found on open, generally steep slopes. The color and organic content of *tzekel* can vary considerably, but it is uniformly thought of as shallow and very stony, and is considered synonymous with "infertile," although it can be and is used for *milpas*. Subordinate *axa* offer modifications of these seven *taxa*; for example, the drier, shallower *kancab-tzekel* is distinguished from wetter, deeper *kancab-profundo*, a relatively modern *taxa*, coined with the introduction of mechanized agriculture.

Table 1: Classification of Puuc Soils

Yucatec *taxa**	USDA	FAO
tzekel	lithic ustorthent	lithosol
kaccab	lithic ustirendoll	rendzina
chacluum	rhodic ustirendoll	rendzina
pusluum	cumulic ustirendoll	rendzina
ekluum	vertic argiustoll	vertic phaeozem

yaxhom	udic chromustert	chromic vertisol
kancab	rhodic paleustalf	eutric nitosol

*Note: Subordinate *taxa* are not included and classified here. The complex group of bog and half-bog soils collectively known as *akalche* is also not included here because these are not agricultural soils.

The Puuc folk soil *taxa* clearly have meanings for peasant farmers far beyond the descriptive implications of their names. Puuc soil *taxa* are particularly laden with significance with regard to the type of maize most suitable for planting in a certain soil. The often greatly varied micro soilscape of an individual Puuc *milpa* results in crop plantings with a high degree of both intraspecific species (especially maize) and interspecific species diversity (Dunning 1990; Gallegos de Castillo 1981). Examination of dictionary and other documentary sources suggests that the people of the northern Yucatan Peninsula have been using many of the same soil *taxa* for at least four hundred years. Moreover, archaeological studies of the use of soils in prehispanic times in the Puuc indicate that many of the same soil distinctions were made then as well (Dunning 1989, 1990).

In contrast to the complexity of the Puuc folk soil taxonomy, Yucatec Maya speakers in many communities in the henequen zone of northwestern Yucatan recognize only a few soil *taxa*. The relative simplicity of the northwest Yucatan folk soil taxonomy may partially reflect a less complex soilscape; however, ethnographic, historical and archaeological sources indicate that many soil distinctions were made by subsistence farmers in the region prior to the severe cultural disruptions of the Colonial and National periods that strongly curtailed traditional agriculture (Bonfil Batalla 1962; Póol Novelo 1980; Shuman 1974; Vlcek, Garza and Kurjack 1978). The relative**[end p. 244]** ignorance of soil variability can be seen as symptomatic of both a lessened environmental sensitivity and a cultural malaise within a disrupted population.

Yucatec Maya soil terms have been long recognized by a variety of investigators studying agriculture in Yucatan, including Argaez and Montañez 1975; Flores Mata 1977; Hernández 1959; Ortíz Monestario 1950; and Pérez Toro 1972. Some folk soil names have been officially given to regional soil series, such as in CIAPY (1984). Unfortunately, these names have been applied rather loosely with respect to their potential implications for Yucatec-speaking farmers, a practice that is reflective of the lack of both cultural and environmental sensitivity that has characterized many regional agricultural initiatives (Ewill 1984; Merril-Sands 1984; Rosález González 1980). One case in point is the attempted development of the Sabana Huntulchac in the Punta Puuc region of Yucatan. This project was predicated on an assumption of homogeneity among CIAPY's Yaxhom Series soils. Area residents, who were not consulted about the development project, distinguish four soils with vertic characteristics (*ekluum, yaxhom, yaxhom-akalche,* and *akalche*), but with highly variable agricultural potential. Unfortunately, the area designated for development using the CIAPY information is largely occupied by highly problematic soils.

If folk soil taxonomies are assumed to reflect cultural adaptation to a particular environment, then they must change as populations change location. Such ongoing adaptation can be observed

among Kekchi Maya speaking peasants who are colonizing tropical lowland areas of Guatemala and Belize. In Alta Verapaz district in the Guatemalan Highlands, the Kekchi Maya folk soil taxonomy distinguishes first between arable and non-arable land; secondly, among arable soils, between warm and cold soils; and thirdly, among various types of warm and cold arable soils. Working among Kekchi agricultural colonists in the vicinity of Lago Izabal in the Guatemalan Lowlands, Carter (1969) observed that only the warm soil (*kixnal choch*) subordinate *taxa* were in use. However, the use of such *taxa* was complex. The Kekchi Maya *taxa* distinguished variation in texture, color and, with considerably greater precision in the lowlands than in the highlands, drainage characteristics, necessitated by the large quantities of hydromorphic soils in the Lago Izabal region. As in other folk taxonomies, most *taxa* have multiple meanings. *Lichoch*, or "loam," for example, describes loamy soils with dark epipedons and clayey, black or yellow subsoil, and with moderately good drainage. As new arable land *taxa* were created, the catch-all "trash land" (*mu'ru*) category would shrink. Significant colonization of this region began in the 1950s, and Carter observed that it was the initial colonists among the community members studied who were most often experimenting with modified cultivation techniques on different soils and, thus, helping create new arable land *taxa*. A similar process of interpersonal diffusion of soil knowledge and soil taxonomy development was noted by Wilk (1981) among Kekchi colonists in southern Belize.

Kekchi agricultural colonists have also begun moving into the Lago Petexbatun region of Guatemala's Peten district in the past few years, following the incursion of "*monteria*" logging roads (Demarest and Dunning 1990; Dunning and Demarest 1990). The Petexbatun is an extremely wet region, and most of its soils are at least partially hydromorphic in nature. Compared with the Kekchi of Lago Izabal, the present-day, newly arrived farmers of the Petexbatun employ a rather simple taxonomy of warm soil terms and generally assign more than 60 percent of the region's soils to the *mu'ru* category. Archaeological investigations indicate that the prehispanic Maya inhabitants of this region utilized a wide variety of soil environments. In 1990, Kekchi colonists were amazedly uncovering various *tierras manejadas* -- usually in the form of relic agricultural terraces -- in an area they thought unsuitable for such intensive agriculture. Portions of the Petexbatun region were inhabited by Lacondón Maya subsistence farmers until warfare drove them from the area in the 1960s. Based on the complexity of Lacandón soil terminology in use in neighboring Chiapas, the Lacandón of the Petexbatun could have taught Kekchi and other immigrants much about agriculture in the region (Nations 1979).

DISCUSSION

"Soil is one of the fundamental elements of the environment, for it supports the vegetation and, indirectly, the animal life from which man derives the greater part of his food supply along with much of the materials for his tools, clothing and shelter. Yet soil is perhaps the least adequately studied of all the major features of the habitat of the Middle American Indians...." (Stevens 1964, 285).

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Unfortunately, this quote remains largely true 25 years later. Both the technical and ethnographic

study of soils in Middle America are woefully inadequate for most types of synthetic analysis. In the 1980s only limited attention was given to the study of folk soil classification systems. There has been, however, an increasing recognition of the significance of such systems for the understanding of traditional agricultural systems. Hence, many ethnographic and agronometric studies in Middle America are giving greater attention to soil perception as a part of soil use in traditional agriculture. Among social scientists, geographers -- particularly those with expanded training in natural sciences -- may be in a unique and valuable position to further the understanding of folk soil systems. Given the importance of folk soil knowledge to successful agricultural adaptation and change, we must take the initiative to further research in this area.

Folk soil taxonomies among indigenous populations and among transplanted agricultural colonists are important indicators of the relative stability and adaptive success of peasant farming systems. The survival of traditional lifeways is based on the success of agriculture. Agricultural success, in turn, is in part dependent upon perception of soil differences which are important to the growth of specific plants. Folk soil taxonomies, thus, are adaptive mechanisms that relate traditional agricultural practices to specific environments. With the gradual replacement of indigenous languages by Spanish and the relative decline in importance of traditional subsistence agriculture, many Middle American folk soil taxonomies have become simplified. This simplification represents a loss of adaptive agricultural knowledge.

The maintenance of indigenous language folk taxonomies is directly related to the stability of farming systems. Folk soil knowledge, while highly adapted to its environment of origin, becomes part of the sometimes maladaptive agricultural technology transferred between regions through agriculturally oriented migration; it must be readapted for new environmental circumstances. The amount of attention given to folk soil perceptions and other aspects of traditional farming systems in large-scale agricultural development projects is highly variable (Brush and Turner 1987). In general, the perceptions and practices of peasant agriculturalists -- if they are taken into account at all -- are considered established elements of culture, without adequate evaluation of whether the peasant system is environmentally well-adapted. This situation is exacerbated by a declining role played by basic ethnographic field research, both in its own right and as an integral part of larger projects. Those seeking to modernize or transfer farming technology would be well advised to consider folk soil knowledge in both the conceptual and implementation stages of development programs. The status of folk soil knowledge in a target area may well influence the likelihood of success for agricultural change. Indigenous peoples may have as much to teach outsiders as we have to teach them.

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