Larry L. Patrick
The University of Texas-Austin

Geographic Research on the Pre-Hispanic Period with Emphasis on Agriculture

Latin Americanist geographers who worked on problems of pre-Hispanic agriculture during the 1970s broke with several time-honored conventions. The purpose of this paper is to expose the general outline of this break. To accomplish this I describe a general pursuit in the 1970s to verify ancient New World landscape diversity and how geographers now attempt to understand this diversity. The paper concludes with suggestions for research in the 1980s.

The 1970s in Context

Few practices could be more dissimilar than hydraulic agriculture and forest or bush fallow cultivation. One epitomizes the high level of intensity at which physically re-worked earth surfaces can be used over the long term to produce domesticated foodstuffs. The others qualify as some of the most extensive and physically unaltering (over the long term) land use practices now known. Yet, in a sense of intriguing historiography, these contrasting cropping techniques simultaneously dominated during the late 1950s and throughout the 1960s the thought processes of many outstanding anthropologists and cultural geographers who sought to understand the agriculture of antiquity.[1]

During the 1960s, at least four conclusions were drawn regarding these techniques:

1) The environments within which crops were grown were viewed as spatially homogeneous and could be dichotomized in types such as dry and wet or highland and lowland;
2) Largely because of this assumed homogeneity of physical environments, for all agricultural places few cropping techniques other than hydraulic irrigation or shifting cultivation were considered as significant explanatory variables within contexts of socioeconomic problems;
3) In any particular agricultural place few cropping techniques were thought to have been used with each other or with the assumed more dominant hydraulic or long fallow enterprises;
4) Those places where early farmers physically altered the earth's surface for the

benefit of plant growth were considered to be few in number and restricted in area.

The consequences of these conclusions were wide ranging. For example, observed remnants of agricultural works with the exception of hydraulic engineering were judged to play but a minor role in local population support capacity and the evolution of settlement patterns. Such was the case of dryfield crop terraces of the Yucatan, known to exist since the 1920s yet never given any significant attention until recently (Turner, 1978b). Also, the dichotomy of cropping techniques that was developed during the 1950s and 1960s to aid understanding of early agriculture at a local scale remained largely unchanged. Civilizations were believed to arise along exotic rivers or above subterranean streams that could supply politically controlled irrigation water to local, integrated, and very often used fields, while at other places most of the rest of mankind was seen to hack and fire its way across forested backwaters. Lastly, intensive agriculture and the physical alterations of the earth's surface attendant to it were said to be synonymous with the culture hearths of the ancient world.

Through their own research efforts Latin Americanist geographers in the last decade have come to suggest ancient cropping scenarios of some very different sorts. In particular, the earlier bi-polar interest in hydraulic techniques and slash-and-burn agriculture came less and less to fit the geographer's observations on how Amerindians worked their crop lands. Instead of verifying the use of restricted number of cropping techniques in the New World, research has led to the identification of approximately 40 relic forms of cropping techniques. In addition, rather than finding support for a single dominant method of producing foodstuffs at particular places, evidence of several methods used locally by Amerindians was uncovered, and the use of these multiple forms beyond the recognized limits of New World culture hearths was confirmed. The Maya swidden hypothesis was rejected and ideas supporting the singularity of Peruvian and highland Mexican use of hydraulic engineering was accepted (Turner, 1976, 1978b; Mathewson, 1977; Devevan, in press).[2]

Landscape Diversities

The report of Pre-Columbian ridged fields by Parsons and Denevan (1967) started a research trend that grew through the 1970s and gives no present indication of subsiding. Because of that publication and questions raised in it, many Latin Americanist geographers have just spent a decade straining glances

through airplane windows, maneuvering Land Rovers slightly further into the bush, settling in with the latest results of new aerial photography techniques, and combing archival reports, all in an attempt to discover unknown relic forms of past agricultural land use or to extend their known distribution just a bit further. The results speak for themselves. The uncluttered agricultural dichotomy once thought to hold true for of pre-Hispanic Latin America is now challenged by diverse examples of relic forms of food producing techniques. To a degree never before realized it is now accepted among geographers that most Amerindian agricultural groups possessed widespread abilities to lower, raise, level, drain irrigate, arid otherwise alter planting surfaces for the sustained benefit of crops planted. While individual places earlier had provided varied glimpses of some of these techniques, it was largely during the 1970s that the presently known scale and sense of agricultural diversity came to be appreciated. In regions once thought to be occupied primarily by forest fallowers we now find relic evidence of mounding, terracing, levee cultivation, ditching, raised fields, hillside indentation, and irrigation farming, as well as inferred evidence of house gardening, orchard gardening, use of artificial rainforest, inter-cropping, and crop rotation (Wilken, 1971; Harrison and Turner, 1978). Where valley-wide canal irrigation was thought to have prevailed, we now find local relic pit fields, floodwater farming, water table farming, walk-in wells, and natural seeps, used to redirect water flow onto fields (Kus, et al. 1977; Kirkby, 1973; Knapp, 1979; Parsons and Psuty, 1975).

As noteworthy as this discovery of new techniques is the realization that scale of distribution is much greater than previously believed. For example, crop terraces have long been known to exist in highland Mexico and Peru and in a few other scattered places but only recently has their distribution been uncovered in every Pacific coast country of the New World from the United States to Chile and In lowland areas where they had not previously been reported (Donkin, 1979; Denevan, in press). Raised fields early described by Denevan in the llanos de Mojos have been sighted over extensive areas not just in Botivia but also in Ecuador, Colombia, Venezuela, and Surinam and to the north in Belize, the Yucatan, Campeche, and within the Central Valley of Veracruz, Mexico (Parsons, 1969; Parsons and Shlemen, in press; Zucchi and Denevan, in press; Siemens and Puleston, 1972; Turner, 1974 and 1978; and Siemens, 1977). Identified raised fields now number in the millions and cover thousands of square kilometers (Denevan, 1980). At one time hydraulic irrigation was thought to be confined to the highlands of central Mexico and to the arid north coast of Peru. Turner and Johnson's (1979) work now extends that distribution to lowland tropical

environments and adds to an already existing body of evidence pOinting to humid lowland hydraulics in Hispaniola, Guatemala, and Honduras (Denevan, 1980). Very clearly, the protectors of the canal and girders of the tree were not the only practicing farmers of the New World. The earlier emphasis given largely to hydraulic agriculture and its counterpoised swidden agriculture is justifiably questioned in light of our knowledge of these multiple relic forms.[3]

The recent search for other kinds of landscape diversity has been but a short step away. Work that started in the 1960s within geography's sub-disciplines of geomorphology, soils, and plant geography was extended to tropical lowlands by Isphording and Wilson (1973), Siemens (1978), Driever and Hoy (1979), and Turner (1978a) and along the dry Peruvian coast by Kus (Kus, et al., 1977) and Knapp (1979). These individuals encountered micro-level variations in physiography, vegetation, and climate where homogeneous physical environments were once assumed to exist. This type of variation provided a clear environmental context in which to discuss the evidence for multiple agricultural techniques. Siemens (1978) handled this discussion well by providing an ecological framework within which the economic role of canals, *bajos*, and *aguadas* of the Petén could be placed. From this new perspective on ecological diversity came potential subsistence variability (Harris, 1978) and from varied micro-habitats emerged multi-technologies (Turner, 1979b). Even settlement patterns were placed within this newly identified diverse natural environment (Turner, 1978a; Kus, et al. 1977).

As if it were not enough to focus on the variability of agricultural techniques and variance within the natural environment, some of us sought evidence for increased diversity in the foodstuffs produced from these techniques and environments. Harris (1978) emphasized nutritional variability within the Classic Maya homestead by noting the ecology of swidden plot edges and the complex structure of kitchen gardens. He suggested the importance of deer, peccaries, and other game taken during the hunt and believed canals separating raised fields supported fish for food. Some geographers took the lead from anthropologists during the seventies and now support the idea that maize, once thought to be the overwhelming staple in such places as the Petén, was heavily supplemented by consumption of sweet potato, manioc, ramon nuts, and perhaps yam beans (Driever and Hoy, 1979). The idea of the use of tubers within a core area of Classic Mesoamerican seed agriculture suggests the turmoil and certainly the debate in which geographers are now involved.

Some geographers sought evidence of nutritional variability through long distance trade. Siemens suggested that trade through inland canals may have connected Tikal and the interior of the Petén with the Gulf of Mexico and the Caribbean by way of the San Pedro and Hondo Rivers (Siemens and Puleston, 1972). This work on the logistics of water transport pointed to the likelihood that trade was as important as any variable of cropping technique or diversity of local natural environments. Turner (1978a; Turner and Harrison, 1978) considered long distance trade as a means of adding diversity and bulk to local diets. As an example, the extensive zone of ancient crop terracing in the Maya Mountains of western Belize may have served the residents of the central lake region of the Petén.

Beyond Diversity

My task would have been much easier had geographers set out merely to describe the relic agricultural forms, micro-variations of natural environments, and foodstuffs consumed by Amerindians. Such was not the case. The study of variability of ancient agricultural landscapes matured during the 1970s to a point of rigorous model building based on archaeology and existing models of cultural ecology (Denevan, in press). This maturation brought forward ideas on the interplay between cropping, environmental, and dietary diversity and variables of demography, settlement pattern, skills, technology, and labor input.

As more and more evidence of diversity came to light, geographers sought to explain its significance within a larger socioeconomic context, that of agricultural land use intensification. Through the 1970s geographers created at least three models to give structure to this process. It is here that agreement among us is perhaps less complete than the support given the evidence of diversity.

One intensification model takes relic agricultural forms as given at a point in time, then hypothesizes tremendous labor inputs to create and maintain them (Turner, 1974; 1976; 1978a). If such quantities of labor were expended, it is doubtful from an input/output perspective "that the land was (then) fallowed for long periods" (Turner, 1979b, 9). Continuing this reasoning, if fallow periods were necessarily short on the many relic forms being discovered during the 1970s then geographers were unearthing new examples of intensive schemes of land use or at minimum were expanding their known distribution.

Why build any of these features if they were so demanding of labor and time input? The favored answer lies in the stress produced from food shortages, which led to the spread of these intensive systems of agriculture across the landscape (Turner, 1979a). The Boserup (1965) model plays an important role within this approach to the New World intensification process as does a Ricardian sense of intrinsic relative worth of some surfaces previously planted over others only later planted. Population growth over the very long term is implicit within this model of land use intensification. Ultimately this growth can be viewed as an independent force whose impact at a place can be judged from the variety of agricultural techniques found there. Land use intensification, then, is a spread of agriculture from early occupied places where no observable re-working of planting surfaces was necessary in high threshold environments (see Brookfield, 1972) to places in low threshold environments where much labor was needed to create an ecology conducive to plant growth.

Of the two remaining intensification process models, one also focuses on relic agricultural forms but is less functional and more evolutionary in structure. This model departs from the stress model in its attempt to explain the emergence of these forms rather than taking them as a given. My own work on the origins of valley side crop terraces takes this approach (Patrick, in press). I question earlier conclusions that these terraces emerged as products of spontaneous invention, fortuitous experimentation with sloping terrain, or accidental discovery of the benefits of the silt trap. My efforts place terraces within a context of changing vegetation associations as swidden agriculturalists already living on highly preferred sloping terrain shortened fallow cycles until only grasses prevailed (Donkin, 1971). These grasses succumbed only to those farmers using the hoe, which also made possible the physical alteration of sloping terrain. The feature distinguishing my approach to relic terrace forms from that of, say, Turner centers on my insistence that they emerged *in situ*, on terrain already cropped by bush or grass fallow agriculturalists. I should add that other, less utilitarian causes have been suggested for the origins of the crop terrace. Guzman (1979) suggested that the earliest use of terraces within the Grijalva River valley can be linked to religious ritual as much as any need to provide food.

Harris formed a third model, also evolutionary in structure, to study land use intensification that de-emphasized the relic forms of agriculture. For a particular place he sought to understand the change through time from complete reliance on local habitats for foodstuffs to a symbiosis achieved among a "cluster of co-

existing systems of food procurement" (Harris, 1978, 321). "Agricultural intensification...is thus envisaged less as a process by which new and more productive and labor intensive systems of 'permanent' cultivation progressively replaced older and less productive fallow systems...(and more as the) integration of the many systems and the increased flow of information and goods (which) refined the spatial and temporal organization of agriculture as well as regional links" (Harris, 1978, 322). In a highly creative manner Harris placed the anthropologist's functional in-field/out-field concept in a temporal framework. His model postulated that Classic Maya settlements located along stream courses initially were supported by intensively used in-fields. In time these settlements developed trade ties with contemporary, extensively used out-field settlements occupying interfluvial ridges. All settlements intensified their agriculture by interacting with one another. Harris also relied heavily on a stress variable but looked for its presence in non-demographic terms.[4]

Looking Ahead

Latin Americanist geographers will likely continue to seek new or expanded relic forms of agriculture in the 1980s and may even proceed to demonstrate the variability of ancient landscapes in ways beyond those mentioned here. I assume that intensification of the use of planting surfaces will continue for at least a while as a framework for understanding this diversity. If I am correct we must then be willing to question some of our present assumptions, among which the following are particularly noteworthy.

1) Expansion of Amerindian agricultural lands precedes in situ intensification of lands already cropped. According to Brookfield, (1972), any expansion of arable lands onto unworked earth surfaces, regardless of whether new cropping techniques are involved, is not part of an intensification process. Intensification commences, by definition, only when land is held constant or actually reduced in extent. Present existentialist writing on such themes as "love of place" should be read by Latin Americanist geographers to raise questions about such feelings in a prehistoric context. Perhaps feelings of familiarity with a place overrode a tendency to up-root, move on. and crop elsewhere (Coles, 1970). Centripetal forces among the Maya and other Amerindian culture groups may have been stronger than we think.

2) Western mind sets and research methods can determine those places most preferred by Amerindians for the pursuit of agriculture. "Marginal" lands along

the north coast of Peru today support the agriculture of many campesinos and likely did prior to the Conquest (Watson, 1979). Denevan (1970) found the same circumstances bordering Lake Titacaca. If intensification takes place either in situ or through spatial re-organization of cropping systems, as postulated by Harris (1978) then no place can be considered marginal only because relic forms of crop terraces or raised fields are found there. By this interpretation these places must have been occupied prior to development of these techniques and therefore were not marginal in the eyes of the original occupants.

3) Soaring labor inputs came with the creation and maintenance of relic forms of agriculture. This assertion has already been questioned enough to merit more thought (Bronson, 1978; Harris, 1978).

4) Agriculture, in any place and time, exists for the sole purpose of producing food. Today's 'radical agriculturalists warn us that agriculture must be viewed as a complex way of life and not solely as a means of life support.

Notes

1. I refer here to the Wittfogelian tradition on the one hand and on the other to any number of works by such authors as Carneiro, Conklin, Cowgill, Brookfield and D. Harris.

2. Questions pertaining to the established view of ancient agriculture in the New World had surfaced long before geographers became involved in the issue. During the 1920s Gann and the Ricketsons pondered Maya use of agricultural techniques other than swidden. Similar ideas continued to surface during the 1930s and 1940s. Willey's work on Maya settlement patterns and Palerm and Wolf's work on ecological diversity in Mesoamerica during the 1950s continued this questioning (Turner, 1978b). Geographers' voices were perhaps first heard collectively at the 42nd Meeting of the International Congress of Americanists in Paris in 1976. At that time archaeology was moving beyond the focus of stratigraphy at single sites to consider regional analysis and hinterlands of support capacity for these sites. Geographers became involved by offering spatial models of settlement patterns, soil, and geomorphic studies by field and aerial photograph methods, and the synthesis of a cultural realm with that of a natural milieu.

3. Denevan (1979; 1980) has recently summarized the manifest forms, functions,

and locations of individual cropping techniques now known for the New World so I shall give no attention in this paper to specific examples of them.

4. "It has not been many years since Sauer promoted the need for generally "good times" if changes in agriculture were to prove successful. I only note here that several authors during the 1970s sought to explain change in, or even to, agriculture within a context of stress -- rather the opposite of Sauer's ideas. See Cohen (1977), Harris (1977), Turner (1979a), and Patrick (in press).

References Cited

Boserup, E. *The Conditions of Agricultural Growth: The Economics of Agrarian Change Under Population Pressure.* (Chicago: Aldine, 1965).

Bronson, B. "Angkor, Anuradhapura, Prambana, Tikal: Maya Subsistence in an Asian Perspective," in P. D. Harrison and B.L. Turner, II (eds.) *Pre-Hispanic Maya Agriculture.* (Albuquerque: University of New Mexico Press, 1978), 247-253.

Brookfield, H. "Intensification and Disintensification in Pacific Agriculture: A Theoretical Approach," *Pacific Viewpoint*, Vol. 13 (1972), 30-48.

Cohen, M.N. *Food Crisis in Prehistory: Overpopulation and the Origins of Agriculture.* (New Haven: Yale University Press, 1977).

Coles, A. *Uprooted Children.* (New York: Harper and Row, 1970).

Denevan, W.M. "Aboriginal Drained-Field Cultivation in the Americas," *Science*, Vol. 169 (1970), 647-654.

Denevan, W.M. "Hydraulic Agriculture in the American Tropics: Forms, Measures, and Recent Research," in K. Flanney (ed.) *Maya Subsistence.* (New York: Academic Press, in press).

Donkin, R.A. "Pre-Columbian Field Implements and Their Distribution in the Highlands of Middle and South America," *Anthropos*, Vol. 65 (1971), 507-529.

Donkin, A.A. *Agricultural Terracing in the Aboriginal New World.* (New York: Wenner Gren Foundation of Anthropological Research, 1979). Viking Fund Publications in Anthropology No. 56.

Driever, S.L., and D.A. Hoy. "Population of the Classic Maya Empire." (Paper presented at the Mexico City National Geographic Council of Education meeting, 1979).

Guzman, L.E. "Terrace, Rainfall Agriculture in Mesoamerica." (Paper presented at the Philadelphia Association of American Geographers meeting, 1979).

Harris, D.R. "Alternative Pathways Toward Agriculture," in C.A. Reed (ed.) *The Earliest Agriculture*. (The Hague: Mouton, 1977), 179-243.

Harris, D.R. "The Agricultural Foundations of Lowland Maya Civilization: A Critique," in P.D. Harrison and B.L. Turner II (eds.) *Pre-Hispanic Maya Agriculture*. (Albuquerque: University of New Mexico Press, 1978), 301-323.

Harrison, P.D. and B.L. Turner II (eds.) *Pre-Hispanic Maya Agriculture*. (Albuquerque: University of New Mexico Press, 1978).

Isphording, W.C. and E.M. Wilson. "Weathering Processes and Physical Subdivisions of Northern Yucatan," *Proceedings of the Association of American Geographers, Vol. 5* (1973), 117-121.

Kirkby, A. *The Use of Land and Water Resources in the Past and Present Valley of Oaxaca, Mexico*. (Ann Arbor: University of Michigan, 1973). University of Michigan Museum of Anthropology Memoirs No. 5.

Knapp, G. "Sunken Fields of Chilca: Horticulture, Microenvironment, and History in the Peruvian Coastal Desert." (Master's Thesis, University of Wisconsin - Madison, 1979).

Kus, J.S., M. Moseley, S. Pozoroski, R. Pozoroski, and E. Deeds. "Factores ecológicos en el desarrollo y mantenimiento de riego antiguo en la costa norte del Peru," *Investigaciones Arqueologicas (Trujillo, Peru)*, Nos. 1 and 2 (1978), 17-21, 3-7.

Mathewson, K. "Maya Urban Genesis Reconsidered: Trade and Intensive Agriculture as Primary Factors," *Journal of Historical Geography*, Vol. 3 (1977), 203-215.

Parsons, J.J. "Ridged Fields in the Rio Guayas Valley, Ecuador," *American Antiquity*, Vol. 217 (1967), 92-100.

Parsons, J.J. and W.M. Denevan, "Pre-Columbian Ridged Fields," *Scientific American*, Vol. 217 (1967), 92-100.

Parsons, J.J. and R. Shlemon. "Mapping and Dating the Prehistoric Raised Fields of the Guayas Basin," *Boletín de Museo Anthropólogico (Guayaquil)*, in press.

Parsons, J. and N. Psuty. "Sunken Fields and Prehispanic Subsistence on the Peruvian Coast," *American Antiquity*, Vol. 40 (1975), 259-282.

Patrick, L.L. "A Cultural Geography of the Use of Seasonally Dry, Sloping Terrain: The *Metepantli* Crop Terraces of Central Mexico." (Doctoral Dissertation, University of Pittsburgh, 1977).

Patrick, L.L. "Los Comienzos de terrazas de cultivo en el Mundo Nuevo dentro de un contexto de la intensificación del uso de la tierra," *América Indigena*, Vol. 40 (in press).

Siemens, A.H. "Karst and the Ancient Maya," in P.D. Harrison and B.L. Turner II (eds.) *Pre-Hispanic Maya Agriculture*. (Albuquerque: University of New Mexico Press, 1978), 117-143.

Siemens, A.H. "Some Patterns Seen from the Air," *Journal of Belizean Affairs*, No. 5 (1977), 5-21.

Siemens, A.H. and D. Puleston. "Ridged Fields and Associated Features Along the Candelaria River, Mexico: New Perspectives on the Lowland Maya," *American Antiquity*, Vol. 7 (1972), 228-239.

Turner II, B.L. "Prehistoric Intensive Agriculture in the Maya Lowlands: New Evidence for Old Approaches," *The Geographical Review*, Vol. 66 (1976), 73-82.

Turner II, B.L. "Ancient Agricultural Land Use in the Central Maya Lowlands," in P.D. Harrison and B.L.Turner II (eds.) *Pre-Hispanic Maya Agriculture*. (Albuquerque: University of New Mexico Press, 1978a), 163-182.

Turner II, B.L. "La agricultura intensiva en labor en las tierras bajas Maya: lecciones del pasado," *América Indigena*, Vol. 40 (in press).

Turner II, B.L. and P.D. Harrison. "Implications of Maya Agriculture," in P.D. Harrison and B.L. Turner II (eds.) *Pre-Hispanic Maya Agriculture*. (Albuquerque:

University of New Mexico Press, 1978), 337-373.

Turner II, B.L. and W.C. Johnson. "A Maya Dam in the Copán Valley, Honduras," *American Antiquity*, Vol. 44 (1979), 299-305.

Watson, R. "Water Control and Land Use on the Arid North Coast of Peru: Prehispanic Agricultural Systems in the Chicama Valley." (Master's Thesis, University of Texas, 1979).

Wilken, G. "Food-Producing Systems Available to the Ancient Maya," *American Antiquity*, Vol. 6 (1971), 432-448.

Zucchi, A. and W.M. Denevan. *Campos Elevados y Historia Cultural Prehispanica en Los Llanos Occidentales de Venezuela.* (Caracas: Universidad Catolica, in press).