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Research on Forests and Man in Latin America

Forestry, one of the primary commercial activities in Latin America, has been of limited concern to research geographers. Neglect by geographers and others is not justifiable, for Latin America has a quarter of the world's forests, only a small fraction of which are being managed rationally. The place of forestry must be considered in any ecologically and economically viable development plan for the area.

There are very few articles on commercial forestry in Latin America written by geographers. Articles which could be classed as cultural plant geography treating aspects of forest exploitation include those by Parsons (1955), Denevan (1961) and Johannessen (1963). All three treat the interaction of fire, man, hardwoods, and pine in a historical and ecological framework in three distinctive environments of Central America. Other important works on the defining the role of forestry in tropical land use systems and in economic development have been contributed by Tosi (1964) and Dickinson (1967, 1969). These works and more like them would provide valuable background for specific studies of the location and potential development of forest industry and forest management techniques.

Joseph Tosi has probably contributed more than any other geographer to defining the place of forestry in tropical land use (Tosi, 1964). He uses the Life Zone Ecology concept developed by Leslie Holdridge at the Tropical Science Center in Costa Rica. This system permits a high degree of precision in correlating human activity with vegetative associations (Holdridge, 1967). A significant aspect of Tosi and Holdridge's work is that it is being done in Latin America in close cooperation with Latins, and is published in Spanish. Life Zone maps and terminology are widely used from Guatemala to Peru (Tosi, 1960).

Uses of the forest

Forests, in the broadest sense, supply cooking fuel and housing for many millions of lower income families and commercial products for industrial Latin America. Roughly eighty per cent of forest production is classified as fuelwood (Food and

Agricultural Organization, 1963), even though the forest may be no more than a relic second growth scrub which women glean with a machete for a day's supply of sticks and twigs. Though the urbanite may dwell and work in buildings of concrete, steel and glass, the peasant relies heavily on locally obtained wood for his housing. The quantity and quality of forest products available drastically affect his dwelling style. Forests accessible to populated areas have been devastated by fuel gatherers and house builders or converted to permanent cropland and pasture.

Where the tropical forests remain, they serve as efficient nutrient storage, release, and recovery mechanisms in widespread shifting agriculture. The tremendous volume of wood utilized for this purpose has no parallel in developed countries. Thousands of years of this process have left little mark on the landscape; only in relatively recent times has explosive population growth caused massive damage to land and forests. The spread of cattle ranching into previously forested areas has probably done even greater ecological damage. Most Latin American countries have extensive areas of tropical forest available for commercial production but still must import many of their wood products. This anomaly has several causes, including 1) that much of commercial forestry is geared to the selective extraction and export of high value woods, such as mahogany, which comprise a small percentage of the total stands; 2) isolation of forests from centers of consumption by distance and poor communications permit the profitable extraction of only the high-value woods; 3) technology required to log, process, and utilize woods from the heterogeneous tropical forests is lacking; and 4) the accident of evolution caused the spread of the pine from its northern hemisphere hearth to halt in Nicaragua. The last mentioned factor is probably the single most important environmental factor which has limited the development of forest industry on the North Temperate model.

There are some difficulties inherent in commercial use of Latin American forests. The modern pine forest industry built around the production of lumber, paper, fiber board, and other products from the northern conifers cannot function in the tropical hardwood forest, for the heterogeneity of species there is matched only by the diversity in their wood characteristics. The technology does not yet exist to fully utilize the humid tropical forest; neither the highly selective logging of cabinet woods nor the reduction of every tree to chipboard have proved to be economical uses: viable industries exist where sustained yield plantation of exotics such as pine and eucalypt have been established in temperate or subtropical areas.

This is particularly true in parts of Chile and southern Brazil. The slow-growing *Araucaria* or Paraná Pine, though occurring in nearly pure stands in its native habitat has not been able to provide a sustained yield resource and has virtually disappeared as an economic species over much of its range.

Even though there are problems in their exploitation, the American tropics are uniquely suited for the production of forest products for mid-latitude markets. Production of trees can be far more rapidly and economically accomplished in the tropics than in the middle latitudes. Although most of the tropical forest trees are not notably fast growing, particularly those species common to the primary forest, some of the native secondary succession trees and exotic genera of pine and eucalypt offer a largely untapped resource for rapid production of wood for a variety of uses. Development of forest-based industry depends on initial incentives for either import substitution or export. Which incentive applies depends to a large extent on the levels of demand-creating development in the country. Brazil, for example, has a large and sophisticated level of forest industry which could be expanded to include an export sector.

Many people work on the fringes of commercial forestry, sawing lumber, collecting sap, cutting firewood, or making charcoal to supplement their income or make up the deficit in subsistence income from agriculture. We know very little about the costs of such forest use in terms of human energy and capital invested or in stress on the forest ecosystem. Neither do we know the returns, their seasonal fluctuations, or long term trends. The complex labor-intensive forestry and agriculture of the Mexican peasant living at the forest edge may be more socially and ecologically sound and have a more equitably distributed total output over time than a modern logging operation. The Andean peasant has developed a fairly stable mixture of farming and plantation forestry (Dickinson, 1969). The above examples are both from temperate highlands.

Suggested geographic research on forestry

The foregoing discussion raises several points of possible research in a broad area related to forestry in Latin America. Some topics may be relevant to economic development in the forestry sector, others simply exciting. Six themes of research are proposed here.

Is there anything unique or characteristic about the ways people of Iberian or Amerindian cultures perceive their vegetated surroundings? Superficial

observation would indicate that there is. For example, in southern Brazil, one encounters the terms *campo limpo* (clean land) and *campo sujo* (dirty land), the latter referring to grasslands in which clumps of trees persist. The Spanish verb frequently used to describe clearing the land is *limpiar* (to clean). If particular culturally derived attitudes toward forests exist, can they be identified and their implications for the landscape examined? Differential uses of the tropical forest by people indigenous to the area and Indian or mestizo immigrants from dissimilar environments would make an interesting comparison. Louis A. Paganini (1970) used this approach in his dissertation on land use systems in the Darien of Panama. Attitudes toward forests as economic, ecological, or aesthetic resources may call for new approaches in land use planning and policy. The unique characteristics of the tropical vegetation may evoke fundamentally different reactions from various cultures.

Where has the pine been introduced and where not? The Monterrey pine has proved extremely successful in Chile, apparently displacing the eucalypt in importance. The Slash and Caribbean pines are being planted to supplement eucalypts as a source of paper pulp in Brazil (Dickinson, 1967). Pine and other northern hemisphere conifers have been the predominant source of wood products in modern times. It would be interesting to observe and predict whether the countries south of Nicaragua will develop management and processing techniques for southern hemisphere trees, or whether they will build toward self sufficiency in forest products based on introduced species. Man in America moved useful and ornamental trees from place to place since long before the Conquest. The pine is extremely useful as a source of light, kindling, patching and sealing material, and medicine as well as wood. Why was the pine not planted in places it did not occur naturally? Or was it? Has the absence of appropriate *rhizobia* been the only limiting factor on the diffusion of pine in the New World?

In an effort to achieve more effective forest utilization and insure social benefits for workers in forestry, the government of Mexico has established large integrated forest industries which produce, in addition to lumber, such products as paper pulp, plywood, and particle board. These industries have been established in both coniferous and tropical hardwood forest areas. It would be interesting to compare the effectiveness of the two industries as in the two different environments. The legal basis upon which the Mexican government can act to establish and control such industries is that the forests, like minerals, are the patrimony of the people and only the government can issue the documents needed to legally exploit the

forests. What are the effects of public forest resource ownership on the manner in which the land is exploited and the development process?

In parts of Mexico and Central America, use of firewood and charcoal persists even though petroleum fuels may be cheaper. The transition to fossil fuels has proceeded more rapidly, it would seem, where the roasting of tortillas is not part of the culture. Socioeconomic stratification has a significant influence on both dietary preferences and ability to purchase more modern fuels. Distinctive woodsheds may exist in different cultural areas. The massive use of charcoal to produce steel in Brazil is one of the greatest anomalies of forest use in this century. Lacking coal, the steel companies, Belgo Mineira and ACESITA, are each developing eucalypt plantations to supply charcoal for the production of about one million tons of steel per year on a sustained basis. It is calculated that about 250,000 acres of planted forest are required (Dickinson, 1967).

In the lowland humid tropics, man has not achieved a viable *modus vivendi* with the forest. The inevitable failure of tropical lumbering operations seems to be the rule. Whether the entrepreneur fails or not, the transient operation pays low wages and leaves little of value behind when it moves on. The measure of dynamic stability afforded by forest fallow agriculture has been shattered by population pressure, land and labor extensive ranching, and highly subsidized export monocultures. Little research has been focused upon so-called primitive systems of dooryard agriculture which simulate diversity and productivity of the multistoried tropical forest. A means by which the geographer, working with specialists in other disciplines, can analyze the man-forest interaction, is through analog modeling (Stoddard, 1967). Such parameters as incoming solar energy, human work, calorie value of charcoal, and dollars can be equated in the same units and the output from several alternative land use systems compared (Odum, 1970).

Conclusion

The mature, or climax, natural landscape in most of Latin America is forest. This forest is being supplanted by a rapidly changing cultural landscape dominated by open range land and lesser extents of forest fallow and permanent cropland. The ecological and dollar cost of destroying the natural forest resources of Latin America will be great. Geographers working with scientists in other disciplines can perhaps recommend alternative mixes of environmentally and economically rational land use. Research on some of the topics outlined in this paper would be

an auspicious beginning.

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