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## **Forest Uses in Latin America**

A decade ago, Dickinson (1971, 215) observed that "there are very few articles on commercial forestry in Latin America written by geographers." Although there have been several contributions by geographers in the 1970s, Dickinson's observation remains largely valid today. Forestry as a commercial primary activity in Latin America is still a neglected area of research, which is surprising considering the present and potential contribution of forests to Latin American development.

This paper reviews contributions (mostly in English) by geographers or of interest to geographers, for the period 1970-1979. Contributions are mostly journal articles, reports, doctoral dissertations (Deal n.d.), conference proceedings, short notices in newsletters, and books. Information and statistics are also available from organizations concerned with international development, such as the Food and Agriculture Organization of the United Nations (1976a; 1976c; 1977), the World Bank, the Agency for International Development, and the Inter-American Development Bank. Bulletins or newsletters from individual Latin American countries occasionally contain information on forestry.

Brazil, Mexico, Chile, and Belize have received the most research attention during the period under study. Topically, contributions can be divided in two broad groups: 1) those that stress commercial uses of forests, including aspects of forest research, inventory, planning, policy, and management; and 2) those that stress environmental consequences of forest exploitation and destruction in Latin America. This review emphasizes the commercial uses of forests.

### **Commercial Uses of Forests**

#### *The Role of Forests*

Of all developing areas in the world, Latin America has by far the largest proportion of its total land area in closed forests (mature forests with closed canopy) and the largest ratio of closed forest area to population (World Bank, 1978). This ratio, however, varies widely from one Latin American country to another (United Nations, 1976a). Forests provide a wide range of useful products,

including fuel, building materials, food (gathering of nuts, fruits and berries, and hunting), and industrial products (particularly newsprint and other paper). In addition to providing renewable economic resources, forests play an important ecological role by protecting soils from erosion, regulating water catchment areas and stream flows, and generating micro-climatic effects.

Latin America's forests are of three types (Inter-American Development Bank, 1979): highly mixed tropical rain forests, which predominate (as in the Amazon Basin); forests/savannas, accounting for about one-third of all forests and providing considerable amounts of fuelwood (in Mexico, Central America, central Brazil, and the Chaco); and commercial coniferous plantations (in Brazil, Argentina, and Chile). Most exploitable forests in Latin America are not commercially accessible at present; moreover, selective logging is made difficult by the high heterogeneity of species. Most of the forest removed in Latin America is not utilized, as it is cleared primarily to expand agricultural frontiers or urban areas.

Forestry research in developing countries is incipient (Iyamabo, 1976), particularly in Latin American countries. Research is usually undertaken by government divisions, semi-autonomous government research institutes, universities, industries or regional research organizations. The number of forest technicians and skilled workers needs to be greatly expanded, and forestry education curricula need to be improved (Bucarey, 1975). Latin American countries must become more aware of the need for forestry research and education; forests must be part of an integrated agrarian policy; forestry legislation and financial incentives must be modernized (Anon., 1972).

## **Forestry and Development Organizations**

During the 1970s, there was little United States private investment in forestry projects in Latin America (Gregersen and Contreras, 1975). International organizations, however, have become more aware of the importance forests can have in development. For example, the World Bank has come to view forestry as an essential component of rural development even though the Bank's lending for forestry is still very limited (Spears and Yudelman, 1979). During the 1968-1977 period, the Bank's lending for forestry was less than 1 percent of total Bank lending for agriculture; this percentage is estimated at 3 for the 1978-1980 period. The Bank plans to increase lending for forestry projects fivefold over the 1979-1983 period, to reach one-half billion dollars in 1980. 89th the number of projects

funded and the number of developing countries benefiting are increasing commensurately.

The Inter-American Development Bank (1979) has also increased its lending for forestry and now devotes a section to forestry in its annual report on Economic and Social Progress in Latin America. The Canadian International Development Agency has realized the growing importance of forestry in developing countries and the technical expertise Canada can offer in this field (Anon., 1979b). The International Development Research Center has also funded several forestry research projects in the developing countries during the 1970-1978 period, representing approximately 2 percent of the Center's funded projects in terms of both number and cost (Shirkie, 1979). The Center's most important forestry research project was to determine the industrially functional properties of over 100 relatively unknown tropical timber species of the Andean region.

Some loans were made for innovative forestry development. For example, as part of the Venezuelan Trust Fund administered by the Inter-American Development Bank, a loan was made to build the first floating lumber factory in Latin America (Anon., 1979a). The mill is located in northeast Peru and produces plywood. It will employ about 180 workers when it reaches full capacity. As this innovation reduces floating distance and time, the trunks do not reach the mill as water-logged or deteriorated. The baled finished product is shipped to Leticia in Colombia where it is airlifted to market. Venezuela also made an important loan to Honduras for forestry development (Anon., 1977).

### **Forest Uses: Case Studies**

Crocker (1973; 1974; 1976) has examined the evolution of the use and management of forests in Mexico. A rational forest policy did not evolve in Mexico until the nineteenth century, after considerable forest destruction had occurred. Policy emphasis was then placed on forest protection rather than optimum use. Nevertheless, forests deteriorated further due to unregulated and illegal uses. In 1943, a law was promulgated to promote forest development and conservation. The Industrial Forest Exploitation Unit was created by the Mexican government to consolidate small forest ownership, increase government control of technical forest management, provide technical and financial assistance, and help develop Mexico's wood products industry. According to Crocker, what is now needed in Mexico is not more regulation but rather greater federal funding to implement existing regulations and improve public awareness.

Rees (1971) examined forest utilization in two Tarascan Indian villages in Central Michoacán, Mexico. Communal forests provide year-round grazing and are used by farmers as a complement to crop growing. Forests provide construction materials, fuelwood and charcoal, utensils and furniture, wild plant and animal food supplements, and medicinal plants. Villagers market an increasing range of forest products in nearby towns. Five pine species are used for most wood products; oak species are used almost exclusively for charcoal. Excessive cutting has virtually eliminated several broadleaf species. Recent intensification of forest utilization is explained by four factors: rapid population growth; low crop productivity (particularly maize); increasing scarcity of cropland; and improved transportation to outside markets. Forest depletion is rapid and aggravated by frequently wasteful production techniques and lack of planning for sustained timber yield. If forest depletion continues, the livelihood of many landless Indian families will be endangered.

Eriksen (1973) has shown that Argentina's forests have been degraded for several decades through clearing, burning, and selective exploitation, particularly in the Chaco, Misiones, and Andes areas. Lack of forest production has resulted in the country's increased dependence on wood and wood product imports. Afforestation, mostly with imported trees (poplar, eucalyptus, and pine), began in the 1940s but has been limited.

Forests in Chile have not been protected by adequate public forest management policies, and destructive exploitation has occurred, typically burning trees to clear land for agriculture (Recart, 1976). According to Fried and Bianchi (1970), in Chile most forestry operations are still characterized by a low level of technology, small scale of operation, and low-skilled laborers who are frequently seasonal agricultural workers or other types of migratory workers. Sawmill owners seldom depend exclusively on forestry operations, often having other types of businesses.

Forests cover 40 percent of Colombia's land area and represent a considerable potential for economic development, but less than 1 percent of forest reserves is currently exploited (Anon., 1978). Virtually all trees are tropical hardwoods, but planting of softwood coniferous trees is encouraged by the government. Most wood production comes from Colombia's densely forested fringe along the Pacific coast and from the Caribbean coast and the north central region. Colombia exports sawn wood, molding, veneer, plywood, and furniture, and both export products and destinations are being diversified. The pulp and paper

industry ranks ninth in Colombian manufacturing value-added and employs some 11,000 persons. The Cauca valley accounts for half this figure.

Niles (1979) has described the recently-changing pattern of forest utilization in Guyana where a strong development thrust is leading to greater forest use for settlement agriculture. Over 90 percent of Guyana's population is found in the coastal area; only some 40,000 Amerindians practice shifting agriculture in their forest communities in the interior. Road construction has opened up the interior's forests to selective logging, the main form of exploitation.

Six species account for 75 percent of the volume of timber produced, with the Greenheart (*Octotea rodiaei*) species accounting for 50 percent. Charcoal and fuelwood are not widely used for domestic purposes and are produced by relatively few operators.

Several forested areas have been designated as national parks or other protected reserves in Latin America. The greatest plight Latin American park managers face, according to Megank and Goebel (1979), is shifting agriculture practiced by farmers in search of land and food. They recommend that boundaries be clearly marked and enforced with trained personnel, and that the population be educated to respect the value of parks and other protected areas.

Deforestation is one of Latin America's most serious environmental problems. Yet, in the small Department of Totonicapán in the western highlands of Guatemala, Veblen (1975; 1977; 1978) found that despite a relatively high and growing population pressure, the forest was being preserved. In the past half-century, the ratio of forested land to grassland and cultivated land remained almost constant, even though the department's population more than doubled. Veblen explained this fact by Totonicapán's unique cultural and economic history. The economic value of forests was recognized over four centuries ago, and an important furniture industry evolved". . . due in large part to the fact that Totonicapán has long been surrounded by densely settled areas which prevented the expansion of agricultural activities to meet the needs of its growing population. . . and (due to) the desire to avoid working on the cacao plantations of the coast. . ." (Veblen, 1978, 433). The communal forest system also played an important role in forest preservation and facilitated enforcement of conservation measures. Finally, a strong desire among Totonicapeños to remain as self-sufficient as possible favored the persistence of conservationist forest uses.

Latin American countries fight deforestation in various ways (United Nations, 1976b). In Brazil, the government enacted laws in 1966 and 1970 providing income tax deductions for investment in forestry projects (Anon., 1976c). The results have been encouraging, with over 5,000 approved reforestation projects covering over 800,000 hectares in less than 5 years. The eucalyptus tree can mature in 7 years in Brazil compared to 35 to 50 years in Scandinavia.

Accordingly, Brazil has ambitious programs of pulp and paper production (Anon., 1976b). Brazil, with one-fifth of the world's forest reserves, is a major world producer of lumber, pulp, paper, cellulose, plywood, and laminated wood (Anon., 1976a). The wood industry, however, is progressively moving away from Sao Paulo where the price of nearby land for reforestation has soared in the past decade. The industry is moving to Brazil's North and Northeast.

### **Forests for Energy**

Deforestation is a major problem in the developing world as firewood is the principal fuel for domestic cooking and heating (Eckholm, 1976; Sivard, 1979). Smil (1979) noted that wood consumption statistics are unduly conservative because they reflect basically stem wood consumption rather than total aboveground ecosystem productivity. Yet, a large proportion of fuelwood in developing countries is composed of branches, twigs, stumps, and bark. For a growing number of people in the developing world the gathering of fuelwood involves increasing effort, distance, and cost.

Forests, as a form of biomass, are an important source of energy for Latin Americans, particularly for the rural poor. Goldemberg (1978, 160) estimated that wood accounts for almost one-third of Brazil's present energy needs. Wood is used for charcoal in the Brazilian steel industry, supplying an estimated 40 percent of this industrial sector's needs. In Guatemala, fuelwood has long been an essential energy source, although in recent years its share in the total energy base has diminished (Fitzsimmons and McIntosh, 1978).

Bennett (1979) has examined the present and potential use of forests for energy in Mexico. Due to a lack of favorable ecological conditions and a long history of forest destruction and abuse, Mexico's forests are relatively scarce. The use of forests for energy is an old practice but data are not available to determine the quantity of wood used for energy. In view of Mexico's abundant petroleum and natural gas reserves, Bennett concludes it is unlikely that forests will ever account for more than a minor source of energy. Furthermore, due to her very fast

growing population, Mexico is an increasingly land-hungry nation that generally perceives the forest ". . . as an obstacle to be overcome and not a resource to be managed" (Bennett, 1979, 56).

Jennings (1979) estimated that in the Dominican Republic more wood is grown than used, but certain areas, especially near population centers, are over-exploited while others are untouched (see also United Nations, 1973). She recommended that some areas be harvested and others thinned while some should be left alone. The driest and hilliest areas should be used for forest production. Forest cutting for charcoal and firewood, when done within reasonable limits, is not considered to be as damaging to the forest ecosystem as nomadic agriculture. Moreover, forest cutting is a labor-intensive activity that requires little capital investment.

### *Pine Forests*

Pine species have received much attention in the literature. Recart (1976) described the success of the Monterey pine (*Pinus radiata*) in Chile. This species accounts for 95 percent of the area of all exotic species plantations. Krebs (1973) showed that the Monterey species was introduced in Chile toward the end of the nineteenth century from California and spread rapidly because of its fast growth and strong commercial potential. The impact of the Monterey pine on Chile's economy has been significant. The tree has good potential for pulp and paper production, but excessive monoculture poses disease problems.

Shirey (1975) examined the role of the pine forest resource (mainly *Pinus caribe* and *Pinus oocarpa*) in Honduras and concluded that in order to fully develop its potential, forest destruction caused by shifting cultivation (accelerated by rapid population growth), man-made fires, and periodic bark-beetle epidemics, must stop.

Pine forests were studied by Johnson and Chaffey (1974) in the southern coastal plain of Belize and by Henry (1974) in the Bahamas. Both studies were undertaken for the British Overseas Development Administration which also sponsored two other forest inventories in Belize (Johnson and Chaffey, 1973a; 1973b).

## **Environmental Consequences of Forest Exploitation and Destruction**

Many authorities believe that if present clearance trends continue, the tropical rain

forest may disappear within a few decades and possibly before the end of the century (Myers, 1979). Richards (1975, 24) explains that:

If the vast rain forest areas of the past were to be replaced by a smiling landscape of productive farmlands and plantations, there would be less cause for concern, but unfortunately it is probable that much of the former forest will be replaced by tracts of derelict scrub, secondary savannas and relatively unproductive second-growth forest.

A most difficult task Latin American countries face is the reconciliation of two conflicting necessities: 1) a growing demand for wood, which accelerates deforestation, and 2) preservation of the forest because of its essential role in overall ecological stability. Daugherty (1973) has shown that in the case of coastal El Salvador, intense economic exploitation has led to forest destruction, severe depletion of animal populations, and other ecological disruptions. These disruptions have had in turn a serious impact on human nutrition and economic development in the area. Daugherty (1973, 123) concluded that "economic development and economic stability can only be achieved within a framework of regional environmental diversity and stability, i.e., short-term economic gain at the expense of long-range ecologic stability is self-defeating."

The notion that tropical environments have a comparative advantage for biomass production is widespread (World Bank, 1978). Jordan (1979), however, disagrees with this view. He contends that yearly rates of wood production in the tropics are about equal to those in the temperate zone, and that the consequences of intensive forestry will generally be more severe in Latin America than in North America, for three reasons. First, forests in Latin America are more susceptible to nutrient leaching. Second, the opening of montane forests often results in soil erosion due to indigenous agriculture. Third, the lack of seasonality in much of the tropics results in continuous exponential growth of parasites, especially in monoculture plantations. This last view is shared by other researchers (Bakshi, 1976; Johnson, 1976).

The world's most ambitious program of tropical forest development is in Brazilian Amazonia. As Bunyard (1977, 221) noted, "the jungle for most Brazilians is an obstacle to be overcome; a barrier which keeps them from their heritage of riches and holds back economic progress." The development of the Amazonian rain forest has nevertheless been described by numerous experts as wasteful and ecologically unsound. Denevan (1973; 1978) argues that frontier

colonization and road building in Amazonia should be restricted, as the rain forest can only provide a temporary safety valve for South America's overpopulation and poverty problems for which other solutions should be sought. The Amazon Basin may not become a desert, contends Denevan, but it could become a wasteland. Eden (1978) also stated that forest development in Amazonia is often wasteful and may prove difficult and costly to remedy in the future. He recommends that the *terra firme* (more elevated, free-draining zone), which is more vulnerable to modern agricultural and livestock developments, be used with much caution, and that development be focused on the more productive *varzea* (the poorly-drained areas of the Amazon flood-plain).

## **Conclusions and Recommendations**

Even though the amount of literature on forestry in Latin America has increased appreciably during the 1970s, there is room for much expansion. Geographic research on forest uses in Latin America could focus on the following themes:

- 1) Rates of deforestation and forest thinning. Few reliable estimates presently exist on yearly rates of deforestation and forest thinning in Latin America. Such rates vary widely from area to area. Rates of deforestation can be calculated using aerial photography analysis and remote sensing. Rates of forest thinning are more difficult to determine but can be evaluated in some areas using large-scale aerial photography for different years. Knowledge of such rates is most helpful in planning natural resource use.
- 2) Spatial variation in modes of forest exploitation. Some areas are characterized by subsistence forestry and others by industrial plantations or tree farming. The different modes of forest exploitation vary in terms of technology, investment, labor, and other production factors. They also vary in terms of their linkages with, and spread effects over, the rest of the economy.
- 3) Locational aspects and dynamics of forest industries. Few studies exist that examine the locational factors of wood mills and factories and the spatial dynamics of manufacturing activities in the forest sector. Such studies would be useful in understanding present locational patterns and predicting their evolution.
- 4) Potential areas of afforestation or reforestation. Given a combination of physical factors (soils, climate, topography) and human factors (population pressure and distribution, resources, alternate land-uses) some areas are more

appropriate for afforestation or reforestation than others. Such information is needed for proper land-use planning, an essential component of a successful development strategy.

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