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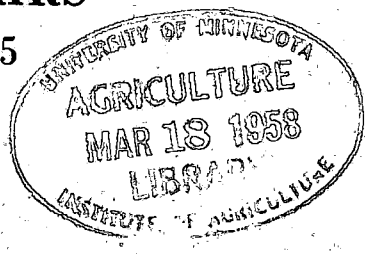

Agriculture and Forestry: Competition or Coexistence?

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COSTA RICA

THE republic of Costa Rica offers an interesting tropical area within which to observe the relations between the two important land uses of agriculture and forestry. Although the agriculture of the country has much in common with the neighbouring republics of Central America, the forestry picture is somewhat distinct as lumber consumption *per caput* is higher than in the other countries. This is due to a significantly greater percentage of construction with wood.

The Republic comprises an area of approximately 50,000 sq. km.[1] with a population somewhat above 800,000. This is a relatively light density taken as a whole, but certain districts such as the Meseta Central carry a heavy population, whereas well over 50 per cent. of the country is still in natural forest.

The main agricultural enterprises are the growing of coffee, bananas, cacao, abaca, rubber and African oil palm as export crops, and beef production, dairying and sugar-cane, grain, vegetables and fruit growing for local consumption. Swine and poultry production are carried on, in general, as subsidiary activities. Agricultural production is the main enterprise of the country.

Sawn-lumber production in 1951 amounted to nearly 100,000,000 board feet,[2] of which approximately three-fourths were consumed by the local market. Other than lumber, there is a heavy use of wood in the form of firewood and charcoal. Railroad ties and fence-posts constitute the remaining principal wood uses, although the majority of the posts are living fence-posts cut mainly from branches or sprouts of older posts. Except for limited areas of edaphic savannas, natural forests covered practically all of Costa Rica before the arrival of man. The range in rainfall from less than 1,000 mm. to over 4,000 mm. per year[3] coupled with the temperature range from sea-level to over 3,000 m.[4] in the higher mountains has given rise to a very complex arboreous vegetation. With the exception of two species of *Podocarpus*, they are all hardwoods, or broad-leaf trees, totalling between 1,000 and 1,500 species for the country.

[1] 1 sq. km. = 247 acres.
[2] 12 board feet = 1 cu. ft.
[3] 1,000 mm. = 39·37 ins.
[4] 1 metre = 3·28 ft.

Pre-Colombian agriculture of the indigenous peoples was not so extensive as in some of the republics to the north-west. This was due probably to the generally prevailing condition of greater rainfall which was not so suitable for the agriculture of the native Indians as that of the drier regions of Central America. Thus, the Spanish colonists in Costa Rica were confronted soon with the necessity of clearing heavy forest for the development of crop and grazing lands. With such over-abundance of trees and an expanding agriculture, it is perfectly logical for the forests to be considered a nuisance. Although they provide a ready source of wood, and food in the form of game and wild fruits, the very profusion of all these benefits categorizes them as items to be taken for granted, like the air, rather than benefits to be appreciated. On the other hand, the toil involved in clearing the forest and the continual struggle against the natural succession of the vegetation in the vicinity of the forest are foremost in the mind of the colonist. Also, the forest harbours predators on his livestock, or animals which inflict damage on his crops. Thus, on the frontier of expanding agricultural settlements there is strong competition between agriculture and the forests. Even today, the same picture of competition may be observed in the outlying districts beyond the ends of all-weather roads where agricultural expansion is in progress. The nuisance value of the forest is clearly indicated by the fact that land values in such areas are considerably higher for land in bush or second growth without lumber than for virgin forest land which may carry appreciable stands of commercial timbers.

However, this is competition between agriculture and the forests, not between agriculture and forestry. In that connexion, forestry develops in two ways, either by being fostered by leaders who have had experience in other regions or who have the vision to see the future economic and land use conditions, or simply as the result of supply and demand coupled with the experience of past and present land use. In Costa Rica forestry is developing, as in many of the neighbouring countries, on the basis of acquired experience and the market for forest products. The few who would advance forestry at a faster pace cannot secure the necessary support. Development is taking place in three broad zones, the first of which is on the frontiers of sporadic agricultural colonization, where the forests are a hindrance to man's activities. There the forests are felled and burned without any appreciable utilization of the lumber. In the second zone, near the ends of developing systems of transport, is a zone of active exploitation

of timber. Because of differences in the climate, topography, and road development, portions of this zone may be either quite near to population centres or again far from them. In this second zone, agriculture and forestry are drawing closer together. In a broad sense this is not forestry, but simple exploitation of the forest resources. Economically, it is still not possible from a short-term viewpoint for any landholder to spend money in caring for his forest when the market price for lumber is determined by the majority of his neighbours who carry on simple destructive exploitation. Still, there is considerable progress towards forestry in that the trees within the forest have taken on a definite value. In Costa Rica, as distinct from many neighbouring countries, there is a market for a great many species as sawn lumber. This has probably developed from the combination of a strong market for sawn lumber coupled with the slow road development into forested areas. Here too, in this zone, it is easier for men of foresight to look a few years ahead to better markets and to leave portions of the farm as woodlots for the future. Also, there is already an accumulation of experience. The farmers comprise some of the early colonists who have seen the forest change from a nuisance to a resource of value or they have moved in from more settled districts where there is a greater appreciation of trees and a better knowledge of satisfactory land use.

The third zone consists of settled agricultural communities traversed with good roads. There, agriculture and forestry have divided up the land on the basis of past land use experience and have attained a satisfactory status of coexistence. With good transportation facilities and nearness to markets, it is economically possible to market practically all of the tree species either for lumber, for firewood or charcoal, or for other uses. The stage has been reached where woodlots are left and exploited on a permanent basis, but without much silvicultural tending or management. That step should develop within this zone in the near future.

There is also a realization that the swing to agriculture has been too complete in many cases with a resulting tendency to let certain areas go back to forest cover or to convert them to forest through artificial reafforestation. In the heavily populated districts, where soils are fertile, there is little room for woodlots or forest plantations, yet it is in these same districts that the most interesting co-ordination of forestry and agriculture has been worked out. In fact, the two are so closely welded that in some cases it is impossible to speak of two

separate land uses. Since this type of combination is rare in the temperate zone, some of the examples are described below.

The coffee plantations of the Meseta Central (surrounding the capital city of San José and other population centres) are all grown under a canopy of shade trees. The pruning of these trees every year to maintain the proper density of shade and the occasional replacement of older trees furnish the major part of the firewood for the region. The trees most commonly used for shade are species of leguminous trees of the genus *Inga* which not only provide shade and some enrichment of the soil but also an excellent firewood. Many coffee farms plant or allow to grow up an occasional Spanish cedar tree within the coffee plantations or along the fence rows. This is a fast-growing species, *Cedrela mexicana*, which provides a highly valued cabinet wood.

Through this same area and also in crop districts adjacent to the coffee belt, the living fence-posts are pollarded every few years which, besides providing new replacements, furnishes a very appreciable amount of firewood. The species most commonly used are *Gliricidia sepium*, *Erythrina Berteroana* and *Spondias purpurea.*

Of interest also at medium and higher altitudes is the use of an introduced conifer for wind-breaks. This is the Mexican cypress, *Cupressus lusitanica*, which was introduced to Costa Rica over fifty years ago. The species grows tall and straight, has a compact branching system and tolerates a wide range of soil and climatic conditions. Thus it is well suited for wind-breaks and is widely used in fence rows for that purpose, especially in dairy farms. The tree produces an excellent timber and even though lumber from wind-break trees is very knotty, it is accepted readily in the market. During the year 1951, the last year for which lumber statistics are available, over 70,000 board feet of this species were sawn and marketed in Costa Rica. Planting of cypress continues at an ever-increasing pace and is being extended to woodlots which will eventually produce a better class of timber and perhaps stimulate still more the use of this species in farm forestry.

Probably the most interesting combination of agriculture and forestry is to be found in the highland dairy region. This region extends up into the mountains from about 1,400 m. elevation, which corresponds to the upper limit of coffee cultivation. Much of this region is really too wet for crop cultivation, having as it has an annual precipitation of over 2,000 mm., but it is very suitable for milk

production with temperate zone breeds of cattle. The dairy farmers in this region have worked out an exceptionally satisfactory and profitable combination of agriculture and forestry by planting alder, locally called 'jaul', in the grazed pastures or cut-grass fields. The alder, *Alnus jorullensis*, is a fast-growing tree which can produce saw-timber in as short a period as ten years. The timber is non-durable, but supplies the equivalent of soft pine wood in a country which is without natural conifer stands, and thus finds a ready market for items such as boxes, cheap coffins, broom handles, &c. As the tree fixes nitrogen in the soil, it has a supposedly beneficial effect on the pasture growth. Trees are planted at regular spacings using wilding stock which springs up naturally on any road bank or open area. To prevent the development of too heavy a shade, trees are pruned two or three times during their life, which automatically improves the quality of the lumber. The branches from prunings and the tops from felled trees are utilized in the same region for firewood. With rapid growth, easy logging and a good road system through the region, the production of alder timber provides an appreciable extra income for the dairy farm with no harm and possibly beneficial effects to the pasture lands. This is undoubtedly one of the most favourable working combinations of forestry and agriculture to be observed in the world. The present area comprises several hundred ha. and the system seems to be spreading into the more distant dairy districts.

The above examples are cited from the third zone of intensive agriculture where agriculture and forestry have changed from a competitive to a mutually helpful status. One other practice, which is developing in the second zone, should be cited. In parts of the Atlantic lowland region, where roads and railroads are already developed but intensive agriculture has not yet been attained, the 'laurel' tree, *Cordia alliodora*, is receiving considerable attention from the farmers. This species produces an excellent timber, widely used in construction, panelling and to some extent for furniture. It is heavily exploited in the natural forest where it is to be found only as scattered individuals. Interestingly, however, with abundant winged seeds for easy dispersal, and ability to tolerate full sunlight, the species springs up in abandoned cultivated areas or pastures, much as a conifer in temperate regions. Owing to the appreciation of its lumber and the rapid growth of the tree, more and more farmers are taking note of the species and leaving such stands for timber development. Often when such second growth or brush areas are cleared for pastures, all

the laurels are left to grow on to timber size. This development is relatively new and stems from the gradually diminishing supplies from natural forest coupled with the rise in market price for the laurel lumber. It is to be expected that there will be a logical development in the care of these stands for forestry purposes alone, which studies have shown can be very profitable.

Thus in Costa Rica there seems to be a perfectly normal and logical development from a state of competition between agriculture and forestry to a satisfactory working relation between them. The pace of this development is tied very closely to the economics of the country, moving forward alongside the increase in population, road development and market conditions, which hinge on availability of supplies and distance to market. It is to be expected that this development will move gradually towards an increasingly more satisfactory land use, working from the areas of more intensive land use and denser population out towards the periphery of settlement.

It may be necessary, however, to look rather deeper for this outcome. There are perhaps two basic conditions to such a development in any country, (1) a generally educated populace which can interpret the relation between cause and effect in nature and thus see the value of conservation of resources, as well as take proper advantage of native tree species and their characteristics, and (2) a satisfactory level of living, so that it is not necessary to cut down tomorrow's possibilities in order to provide bread for today.