Comprehensive Small-scale Upland Agroforestry: An Alternative to Shifting Cultivation in the Balinsasayao Rainforest Region, Negros Oriental, Philippines

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Tropical rainforests are threatened with rapid, widespread destruction and are in danger of extermination. Rainforests constitute the richest, most diverse, most productive, most complex terrestrial ecosystems known, and for this reason alone represent the greatest potential for the satisfaction of human needs. Their destruction will not only rob future generations but may also permanently impoverish the Earth as a home for life of all kinds (Nigh and Nations 1980).

Southeast Asia is one of the world's major rainforest regions, together with Africa and Latin America. The continued increase in the area of land devoted to agriculture has taken place at the expense of tropical rainforest which formerly covered as much as 90% of the southeast Asian region (Rambo 1981). Rambo summarized from available literature the dramatic pace of forest land conversion to agricultural use. In peninsular Malaysia, forests covered 74% of the country in 1957 but only 55% in 1977, with some 2850 square kilometers cleared for agricultural use during each of the last five years. In the Philippines, where three-fourths of the land was still forested at the end of World War II, only 38% was still under trees in 1976, with conversion to agricultural use continuing at the rate of more than 500 square kilometers per year. Equally rapid conversion rates apply to Indonesia, Thailand and Vietnam.

Nigh and Nations (1980) decried the failure to realize that alternatives to destruction exist, that even intensive human use is not contradictory to preserving the rainforest's biological diversity and potential. They maintain that "the time has come for a reevaluation of attitudes, beliefs and development philosophies." In an agricultural country like the Philippines, with large population increases annually, there is a need to assess existing policies on land use and classification, particularly in the utilization of forest land for agricultural purposes.

Several attempts at interdisciplinary study of agricultural systems in Southeast Asia have been made, particularly in Thailand, Indonesia, Malaysia and the Philippines. In these instances, agroecosystems related to forest lands in the humid tropics were the areas of interest. Despite the proliferation of empirical studies of human interactions with ecosystems, researchers have recognized that the variations within the agricultural systems are so complex and the man-nature interactions so di-

verse that no generalizations can be safely drawn. This viewpoint has led to the growing popularity of the "small populations approach"—a study of definable agroecosystems that takes into consideration a great variety of interconnecting factors which generate and receive a flow of material and energy (Pirie 1982).

The present study aims at identifying the nature of shifting cultivation in and around a tropical rainforest in the central Philippines. The physical changes in the site brought about by this agricultural activity are obvious—narrowing forest margin, widening *kaingin* clearings, indiscriminate felling of trees, and rampant harvesting of forest products like rattan,[1] bamboo shoots, orchids and other epiphytic plants.

Estimates made as of the first quarter of 1981 placed the increase of swidden farmers on Negros island at 80% in the last two years. Today, less than 17% of the island is covered by respectable rainforest—this area serves as virtually the entire watershed for the island's nine cities and forty-seven municipalities

Despite efforts of various agencies at reforestation, the problem of forest destruction has continued to grow. While the government has set up the Integrated Social Forestry Program, no definite formula can be prescribed for all forest occupants to arrest the problem of deforestation. If the forests are to be saved, it seems important to understand the nature of swidden farming and the reasons for this practice that may have brought about such perturbation in the forest ecosystem. Court litigation and incarceration would appear to be shortsighted solutions to a problem caused by man's basic need for food (Vergara 1981).

The Study Site.

Negros island is located in the central part of the Philippines, about 620 aerial kilometers from Manila, and has an area of about 13,000 square kilometers, divided into the two provinces of Negros Oriental and Negros Occidental. Negros Oriental, in the southern portion of the island, occupies an area of about 5,402 square kilometers and had a population of 822,923 as of the 1980 census. Dumaguete is its capital city.

The study was conducted in the rainforest of Balinsasayao, a mountain range due northeast of Cuernos de los Negros, the highest mountain peak in the province, rising to about 1870 meters, west of Dumaguete City. The mountains around the Balinsasayao area range from 760 to 1240 meters in elevation. In the midst of the mountains are two lakes of approximately 100 hectares total area: Lake Balinsasayao with a surface

area of 762,581 square meters and a maximum depth of 90.5 meters; and Lake Danao with a surface area of 303,335 square meters and a maximum depth of 57.5 meters. Lake Balinsasayao is at about 830 meters elevation, while Lake Danao is at about 848 meters (see Figure 1).

The topography near Lake Balinsasayao is dominated by Guinsayawan mountain (1788 meters), about 2.5 lineal kilometers to the southwest. The twin lakes of Balinsasayao and Danao were formed from the stream valley systems of this mountain. Both lakes were probably formed about 10,000 years ago when a new volcanic peak, Guintabon (1241 meters), pushed up through the two stream valleys and dammed them. A number of smaller ponds were formed in the Balinsasayao valley. All but one of these ponds have filled with silt; the remaining one is shallow and surrounded by marsh. Neither of the twin lakes has an observable outlet; both lose water through seepage and evaporation. The water level fluctuates, following the rainfall pattern.[2]

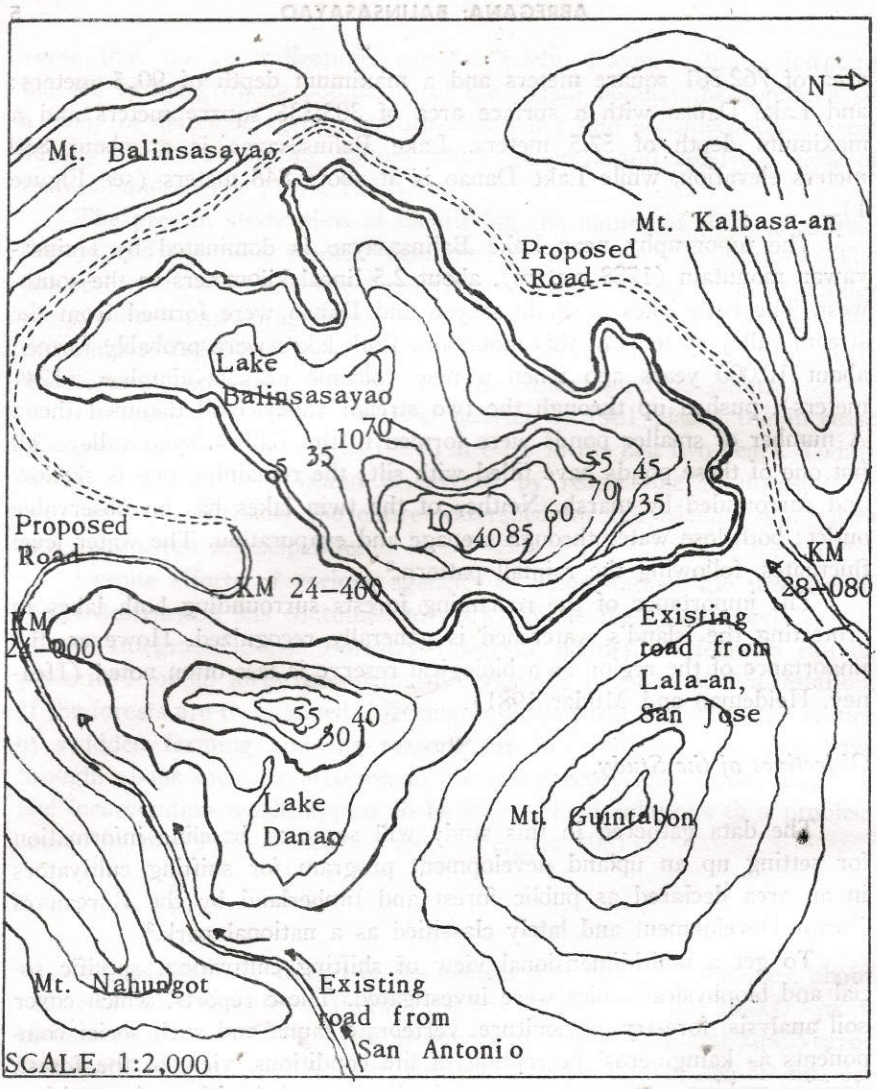
The importance of the remaining forests surrounding both lakes in protecting the island's watershed is generally recognized. However, the importance of the region as a biological reserve is less often noted (Heaney, Heideman and Mudar 1981).

Objectives of the Study.

The data gathered in this study will serve as baseline information for setting up an upland development program for shifting cultivators in an area declared as public forest and timberland by the Bureau of Forest Development and lately classified as a national park.[3]

To get a multidimensional view of shifting cultivation, specific social and biophysical topics were investigated. These reports, which cover soil analysis, forestry, agriculture, vertebrate fauna and such social components as kaingineros' perception of life conditions, view of the forest, decision-making processes, rites and rituals, and health and nutrition, form the basis of the present article.

The Balinsasayao project started with grandiose plans that were later modified to meet practical conditions at the target site, the needs of the target population, and the available human and nonhuman resources of Silliman University. During initial team sessions, members tended to be purely one-discipline-oriented, and initial discussions lacked common frames of reference. To encourage open communication and common understanding among group members about issues raised in the



1. Depths in meters.
2. Zero reckoned from mean water level May 17, 1972.
3. Mountains, existing and proposed roads not to scale
4. Level of Lake Danao higher by 16.04 meters than Lake Balinsasayao on May 23, 1972.

Figure 1. Map of Lake Balinsasayao-Lake Danao area.

study, resource persons (i.e., shifting cultivators, government technical men, international agency consultants and visiting researchers) were invited, topographical maps were used, and arguments and prolonged discussions were tolerated during the sessions. Out of these sessions emerged the identification of the specific goals of the study: (1) to determine the extent of shifting cultivation in the Balinsasayao rainforest; (2) to gather data on such biophysical factors as soil, vertebrate fauna, forest margin and agricultural activities at the site; and to identify some social characteristics, touching sociology, anthropology, psychology, health and nutrition; and, (3) from the above data, to evolve an alternative model to shifting agriculture. Underlying all these objectives was the group's concern with and commitment to the task of forest preservation, with consideration given both to the immediate needs of settlers in the upland area and to the protection of the watershed, thus ensuring the continuance of life among organisms in the ecosystem.

The first objective was met simply by conducting reconnaissance trips to the site to determine the ebbing margin of the contiguous or core forests. Results were plotted on a 1:10,000 scale topographic map. In addition, roads passable by four-wheel drive vehicles, major foot trails and main concentrations of population were located on the map. Soil samples from areas of diverse vegetation and slopes were collected for chemical analysis and the sampling site marked on the map.

The primary consideration in meeting the second objective was the availability of faculty members of the University to engage in research work. The choice of the specific areas of study was dependent on the human resources willing to take time from teaching or administrative assignments. A team of researchers, mostly faculty members, from various disciplines was formed. Some graduate students participated in this study.

When members of the team met for sharing of reports and discussion of issues considered relevant to the objectives of the study, all were in search of an alternative model to shifting cultivation that was person-oriented, location-specific and comprehensive. The model had to meet additional criteria: it should promote upland productivity and ecological stability and also be socially acceptable, practicable and politically viable.

Consultation with the Project Management Board.

The birth of this project was stimulated by a belief in the goals of the National Environment Protection Council (NEPC) and the

Human Interaction in Tropical Ecosystems (HITE) project of the East-West Center, University of Hawaii. The latter gave its technical support by facilitating training opportunities for the project managers of the Balinsasayao Project.

Primarily for professional exchange and for drawing ideas from the experiences of other agencies on upland research projects, the Project Management Board was organized. This Board, headed by the Director of the Silliman University Environmental Center, was composed of representatives from the program on Environmental Science and Management (PESAM) of the University of the Philippines at Los Baños, Kalahan Academy of Sta. Fe, Nueva Ecija, and the Bureau of Forest Development, national and regional levels. The members who met formally 13-15 January 1982, were briefed on the activities of the project and deliberated on the research objectives and plans. Due to budgetary constraints, the Project Management Board was not convened again until the completion of this phase of the study. Written communications, however, were sent to some members of the Board. In one instance, a member of the Board who was in Dumaguete for other reasons shared his time with the project.

Earlier Studies in the Balinsasayao Area

Alcala and Carumbana (1980) from December 1976 through July 1978 made ecological observations on the relative abundance and aspects of reproduction of some birds in southern Negros. Forty-eight species were found, as contrasted to sixty-four species earlier observed in the same area by Rabor, Alcala and Gonzales (1970). Since the study included two wooded-grassland areas aside from the Balinsasayao rainforest, they were able to show that there were more species in the latter than in the former. In fact, some species were limited to rainforests. One of the recommendations of the study was to declare the Balinsasayao area a forest reserve and wildlife sanctuary for scientific studies and recreation.

Heaney, Heideman and Mudar (1981) found 23 species of mammals in the forests surrounding Lake Balinsasayao. Eleven are rare or absent in non-forested regions. Human disturbances caused by agriculture and timber production activities have led to marked changes in the mammalian fauna. They conclude that preservation of forest habitats provides niches for rare species and breeding grounds for economically beneficial species. Cutting the forest removes these benefits

and also increases habitat for economically injurious bats and rodents.

Lowrie, Alcoran and Nalam (1980) measured the levels of dissolved oxygen, biochemical oxygen demand, nitrate, phosphate, chloride and pH in Lake Balinsasayao and Lake Danao, both important sources of fish and drinking water for people living nearby. They found that the high levels of nitrate and phosphate have led to algal growths. The construction of a road near the lakes is considered to have increased the run-off, raising the levels of nutrients in the bigger lake. Deforestation around the lakes by slash-and-burn farmers leads to soil erosion, and nutrients such as nitrates and phosphates are washed into streams which feed the lakes. Oversupply of these nutrients could lead to algal blooms, or eutrophication, which would deplete the waters of dissolved oxygen and decrease the lakes' ability to support fish and other organisms. In 1933, Woltereck described the waters of the lake as "soft and transparent." At present, the waters of Balinsasayao are greenish, a sign of developing algal bloom. The authors concluded their study with a recommendation to curtail plans for further road construction around the lakes and other activities that will further soil erosion.

All these findings support the need to minimize human disturbances in the tropical rainforest ecosystem and harness available human resources and skills in regaining ecological balance in the environment in order to protect the watershed as well as maintain its genetic reserve.

Shifting Cultivation in the Balinsasayao Area

Shifting cultivation has invariably been considered a system of agriculture that has placed man in perfect harmony with his environment (Vergara 1981), and its practice is considered necessary for the sustenance of some upland populations. In some types of shifting cultivation, the forest ecosystem is maintained by giving fields time to regenerate through fallowing (Cadeliña 1980). These observations are valid in areas where the cropping period alternates with a longer rest or fallow period during which the area can regain its fertility and the ecological community can reestablish itself.

In the Balinsasayao region, the increase of population among original upland settlers and the inland push of lowland farmers has led to rapid conversion of remaining forest stands into agricultural lands. In some cases, lowland residents get a share of the forest lands

by buying "rights" to cleared areas from enterprising kaingineros who are hard-pressed for cash resources. At present, the man-land ratio does not warrant long fallow periods after each cropping period. At the rate new kaingin clearings are opened, it is estimated that in less than twenty years the tropical rainforest will have vanished.

Generally, shifting cultivation at Balinsasayao does not involve a shift of domicile, although in a few cases, kaingineros have established makeshift huts near their area of work. Farm activities are commonly undertaken with hand tools like the *bunlay, sundang, sanggot* and *gabang*. A very few farmers own cattle and carabao, which are used more often as beasts of burden than in the preparation of land. Crops are often grown on slopes too steep for draft animals. Livestock such as chickens, goats, cattle, pigs and carabao play a minor role in the farm economy.

The kaingin system is a labor-intensive activity and is greatly influenced by weather and other environmental conditions. The activities include clearing the undergrowth and cutting trees and other vegetation. Small trees are usually cut about one meter from the ground, while bigger ones are usually cut at least two meters from the ground, because of the buttresses which widen their bases. Some trees are spared, especially the big ones, for a variety of reasons: to cut down on labor, to protect soil from erosion, because of superstition. When felled trees and cut vegetation have dried, they are burned. The debris is cleared and crops are planted when there is sufficient moisture. The household head sets his own schedule for planting. Paid or unpaid labor exchange may be sought, depending on the availability of manpower in the household, the size of the area to be tilled and the nature of farm work to be done. Rites or rituals are practiced by some farmers at various stages of land preparation, planting, harvesting and even in the use of farm tools.

The patch is usually abandoned for a period of only one or two years, but in one area for as long as twenty-eight years. Variation in the length of fallow is determined by the size of the household and the availability of food. Kaingin farming in the area is generally a system of low-intensity farm production.

One-third of the respondents had no farm lots of their own. These farmers either worked in their parents' fields or on somebody else's farm, following a mutually-agreed system of sharing produce. Among those who had lots of their own, farm sizes ranged from 0.25 hectare to 35 hectares. The mean total farm size of lot owners was 3.93 hectares. The mean total land area cultivated by the kaingineros at the time of the study was 1.56 hectares.

Although kaingineros engage in wanton tree-cutting, they are cognizant of the need to preserve the forest for ecological reasons. The need to struggle to survive in the here-and-now makes it difficult, if not impossible, for them to actively deal with such future concerns as forest preservation, especially if it might mean totally abandoning forest lands. The majority of the farmers in the area perceived household economic needs coupled with farm problems to be the main concern in their day-to-day living. The specific problems cited were *panginabuhi* and *pangitaan* (Cebuano for "means of living" and "source of income," respectively), minimal cash income, high prices of commodities and low prices for their farm products. In addition to these personal economic needs, they expressed uneasiness about land tenure and complained of low yields and unproductive farms. Field researchers think that the major reasons for the last two problems are inefficient farm practices and limited technical knowhow of farmers.

A Search for an Alternative to Shifting Cultivation

The Balinsasayao upland environment is suffering continual destruction of forest vegetation. Extensive deforestation may bring about changes in climatic conditions, in rainfall patterns and distribution. Lowland farms may be silted and roads washed out during the rainy season, since the areas that serve as watershed will no longer have standing trees or permanent cover. Biological or genetic composition has also been altered in the area: changes in the population of mammalian fauna; an apparent decrease in the number of birds and changes in their reproductive structures; and algal bloom in the lake due to an oversupply of nutrients from streams running along mountain slopes that have been swiddened.

Management of the Balinsasayao upland resource is an imperative task. The strategy for effective management of upland resources must address itself to the need for ecologically sound land-use practices and the basic need of upland farmers to earn a living.

Peculiarities of the model. As was earlier mentioned, the model we are formulating is location-specific. The generalizability of this model applies only to areas that approximate the conditions prevailing in our study site. Moreover, the relative proximity of Silliman University to the area and the availability of various academic units and a medical center which could be tapped for community extension work add to the uniqueness of our proposed model.

The model may impress some readers as requiring excessive work from the members of the implementation team, the local farmers and the government and semi-government agencies involved. Given the nature and the extent of the problem confronting us, we cannot afford to do less than what is demanded of us by the Balinsasayao farmers and the ever-increasing environmental pressures.

Comprehensive Small-Scale Upland Agroforestry

In this model, agroforestry is defined as a system of managing land resources in which related principles in agriculture, forestry, fisheries, animal husbandry and other components are combined, interrelated and applied so that the flow of benefits derived from these resources is sustained for the welfare of the people. It is a system of utilization, development and conservation of resources that uses management practices that suit the social and cultural characteristics of the people and the economic and ecological conditions of the area.

The Balinsasayao region, after an intensive mapping activity, will be classified into areas that are primarily cultivated, areas that are primarily forested, areas for fishing and areas primarily for livestock. The agroforestry system that is proposed considers these major components: (1) component that is agriculture-based, where the primary activity involves principles of traditional agriculture; (2) component that is forest-based, where the primary activity involves preservation and continuance of the forest, and selective exploitation of forest products; (3) component that is livestock-based, where the primary activity involves raising ruminant and nonruminant farm animals; and (4) component that is fishery-based, where the primary activity involves principles of traditional fishery. Aside from these major components, other structures may be set up by strengthening existing income-generating family-based cottage industries and by introducing other beneficial projects.

Under this scheme, upland farmers are encouraged to engage in agricultural activities within the farm lots assigned them, remaining forests are to be strictly free from further encroachments, and the two lakes are to be improved sources of fish supply for the upland community.

Agriculture-Based Agroforestry.

This system is applied to areas that are fully cultivated and have minimum tree growth. This land use classification maintains or increases

total yields by combining food crops with tree crops on the same unit of land. It becomes important to grow both trees and crops on the same land to maintain or increase yields without degrading the environment. Since the upland farmers have been found to plant a random mixture of crops in the field, extension workers could use existing crops as their take-off point for improving the farmers' cropping practices. Contour tillage farming and other improved practices that consider ecologically-adapted systems of farm exploitation should be introduced since these are not presently being applied. Agricultural rituals have to be evaluated for their possible scientific basis.

Combining food crops with tree crops. The size of the farm may determine the use of alternate arrangements of food and tree crops on a given land surface. Intercropping should consider possible competition for space, sunlight, moisture and nutrients, which would reduce food crop yields (Vergara 1982). Farm practices should also deal with rapid regeneration by prolific trees like some leguminous varieties which may displace food crops and take over entire fields. In this system, the trees play an important economic and environmental role. They provide fodder for animals such as goats, food for people, fuel and building materials, leaf manure, and at the same time stabilize the natural environment and rehabilitate the soil.

Smaller farms which would not accommodate an alternate arrangement of food and tree crops could have trees planted along the borders of the plots. In this system, food crops which need little or no shading are planted in the unshaded central space. Aside from their ecological importance, the trees may serve as boundary markers, live fences and suppliers of green manure (Vergara 1982).

The recommendations from completed studies should be assessed in the light of prevailing conditions in the target area. Publications of PESAM at UP-Los Baños and the working papers of EWC-EAPI are good sources of Philippine studies on agroforestry. Ongoing and completed studies on agroecosystems in Southeast Asian countries such as Thailand, Indonesia and Malaysia should also be considered.

Permanent cultivation. The proposal that farmers engage in permanent cultivation in a specific area of land merits a closer look. Brookfield (1972), in discussing environmental variations in agricultural intensification, put forth the possibility of sustained cultivation by very simple means over long periods, under moderate population densities or even quite high densities if conditions were unusually good. Minimizing constraints on the land by adopting a very simple cultivation technology

may sustain subsistence levels of production. Since the upland farmers at present are maintaining below-subsistence levels of production, the project aims at sustaining subsistence agriculture and maximizing the use of natural methods of soil regeneration, like the utilization of green manure and the planting of trees to stabilize the environment and rehabilitate the soil. The Balinsasayao soil, in general, was found to be moderate-to-good in fertility, although the levels of nitrogen and phosphorus in specific areas in the west-northwest region were only fair. To raise pH levels, lime should be applied to the soil. Using ashes from fires would minimize problems of low pH. The use of domestic wastes would help increase nitrogen and phosphorous.

Farming practices based on ecological concepts require a reorientation of the upland farmers; they must manage their farms differently from the way they manage them today. Part of the education process is to make farmers realize the value of the forest and its potential.

Climate elements. The climate of any location is a factor of geography and of the wind systems that prevail at various times of the year. Weather refers to the condition of the atmosphere at a particular time and is thought of in terms of temperature, humidity, precipitation, cloudiness, brightness, visibility and wind. All these climate elements are closely associated with each other and to a large extent determine the final outcome of crop production, livestock raising and fish production.

Negros Oriental's climate type is characterized by not very pronounced seasons. The area is relatively dry from November to April and wet during the rest of the year. The maximum rain periods are not pronounced, with the short dry season lasting only from one to three months. The region is partly sheltered from the northeast monsoon and trade winds, is open to the southwest monsoon, and is estimated to have a 7% exposure to typhoons. Average temperature is set at 27.2° C and average rainfall at 196.24 cm (BFAR/FAO-UNDP, 1981). However, due to the distinct physical and geographic characteristics of the Balinsasayao area, location-specific meteorological data need to be established.

Forestry-Based Agroforestry.

This system should be applied to remaining forest areas that have not been fully exploited for agricultural production. Forest elements such as rattan, hardwood, vines and ferns must be allowed to mature in order to be economically beneficial on a long-term basis. The present practice

of cutting rattan shoots and young hardwoods has to be controlled. Supervised harvesting of these products when mature will prove more economically gainful. The possibility of organizing local people for this purpose should be considered. A forest supervisor should be appointed to oversee activities in the forest.

Measures for the replacement of trees and other forest products have to be implemented. Similar areas in the Philippines have been found to be receptive to almaziga trees. Several varieties of fruit trees thrive well in the Balinsasayao forest, among them, lanzones, durian, avocado, jackfruit, coffee and cacao.

This system requires a massive community-based appeal to preserve the forest, consistent and efficient controls against illegal activities, and regular technical asistance to ensure productive upland farm yields.

Livestock-Based Agroforestry.

Integration of ruminant and nonruminant livestock husbandry and cropping has been found to work well in mixed tropical farming systems, although the degree of integration varies widely according to physical environment and socioeconomic conditions (Norman 1979:253). The livestock component of this model merely supplements the main crop production effort. The care and maintenance of livestock may be assigned to junior members of the family. Nonruminants like pigs and poultry can be maintained on the crop farms at a low production level with little effort. Owing to the low socioeconomic level of the residents in the Balinsasayao area, only a few can maintain stock like carabao, cattle or goats. Nonruminants can provide animal protein for the family and a source of cash income. Carabao and cattle primarily serve as transport, while goats are raised for cash income. To satisfy the nutritional requirements of the farmers' household, milk production from ruminants may be encouraged.

Norman (1979) classified the roles fulfilled by livestock: (1) Production role: for subsistence; for sale; (2) Investment role: as a current "buffering" investment; as an investment for old age or incapacity, or to bequeath to offspring; (3) Sociocultural role: as an element of social prestige; to fulfill cultural obligations, (4) Energy role: to provide draft power; to provide domestic fuel in the form of dung; (5) Nutrient role: to provide manure and ash nutrients after burning.

Fishery-Based Agroforestry.

The Balinsasayao region has twin lakes that may be utilized for additional food resources in the upland community. Because of the low calorie intake and poor quality diet of residents in the area, it is important that plant energy sources be supplemented with animal protein (e.g., fish). At present the lakes yield carp, tilapia, hito and haluan. Bangus was seeded about two years ago but fishermen do not report any significant catch of this species. Integration of fowl culture with fish culture is a possibility that requires careful consideration.

Due to polyculture of fish species in the lake, detailed studies on predator-prey relationships in the lake need to be conducted. In addition, population control of prolific species is necessary to obtain large-size fish. Commonly used population control measures are monosex cultivation and the use of predators. The ratio of tilapia, for instance, to predators has been thoroughly studied (BFAR/FAO-UNDP 1981).

Lake Balinsasayao was observed by farmers to have turned reddish at one time and fish were reportedly in a dazed condition. Algal growths and factors of water chemistry such as salinity, oxygen, pH and water soluble nutrients (such as dissolved nitrogen, soluble phosphate and potassium levels) need to be checked periodically.

Fish pests may include other fish, snails, crabs, insects and vegetation. Some pest control measures need to be identified and effected, since these pests compete for food with the productive species. Other pests compete with natural food production by either disturbing the lake mechanically, or disturbing the food chain.

Other Support Components.

The introduction and cultivation of nonconventional food sources should be considered. *Rana magna*, the edible frog, thrives in the area and may be introduced to the community as an additional protein source. Nonconventional methods of food production, such as bee culturing for honey, should also be studied.

Some families in the area are engaged in such cottage industries as broom-making using tambo, a weed that grows along water banks, as material, making of fishing equipment using sig-id, a vine that dominates the edges of the forest, and hat- and mat-making using pandan as material. Raising of flowers and growing of domestic plants may also be encouraged to augment family cash income.

Implementation Approach

Silliman University, through its research and extension arms, will determine the structure and composition of the project staff that will see to the operationalization of this model.

Identification of Foothold and Target Beneficiaries.

This program covers all the actual settlers within the proposed National Park under the political jurisdiction of Sibulan town. The Bureau of Forest Development has listed 84 families engaged in kaingin within the area. The fieldworkers of this study estimate there are no less than 100 families practicing kaingin in the area.

Mapping activity. In identifying the qualified beneficiaries, it is proposed that the entire National Park area of 3,880 hectares be covered on foot to determine the total number of domiciles considered as permanent homes, and the exact location and sizes of kaingin lots. The output of this activity would be a spot map indicating all households and clearings, with estimated sizes, dates and basis for occupancy. This map and census will serve as a control sheet for regulating entry of new occupants and for prohibition of new clearings, and for identifying forest zones to be placed strictly off limits for agricultural work. From this map, program planners and implementors can classify the site into areas for cultivation, forestry, fishing and livestock production.

There appears to be an implicit arrangement among the kaingineros as to who has the right to till which part of the forest. Each sitio has its own share or division in the forest and these delineations are respected and adhered to by all concerned. Through our mapping, we can identify persons who have "property and supervisory rights" over the remaining forests. With these persons, we may be able to establish and effect concrete measures for keeping kaingin clearings on the forest margin in check.

Permits. Once there is an updated list of actual settlers, it is strongly proposed that the kaingineros be granted official permits to occupy the land they are presently cultivating, on the condition that they refrain from opening new clearings and with the understanding that they have no right to dispose of the land through sale, barter or lease. The farm size per household shall be determined only after an accurate household enumeration has been taken and total cultivable land area has been computed.

Implementation Strategies.

Entry approach. The project plans to use health and nutrition drives for the residents in the area as the vehicle for the agroforestry scheme. Our assessments of the household members' nutritional status reveal low intake of calories and protein. The respondents and their families have also been found to be susceptible to common respiratory ailments. Protein and calorie deficiencies, vitamin deficiencies, and respiratory problems may be caused by low food output per household, inadequate nutritional knowledge and poor health services delivered to the area.

The Silliman University Medical Center and the Silliman College of Nursing will be tapped to send a team of health workers to the area on a regular basis, focusing primarily on the health care of children. Preventive measures should be the main emphasis. Local residents, especially housewives, will be given training in the preparation and medicinal use of local herbs and other plants for treating ailments.

The Department of Home Economics of Silliman University will be asked to initiate a nutrition drive, concentrating on the selection and preparation of food from local sources. Residents will be made aware of the dietary needs of members of the family, taking into consideration the age levels and the nature of work these household members may be engaged in. Special dietary requirements of children, the weak, the sick and the elderly will also be presented.

Building on these initial contacts, parents may be called to discussions of common health and nutrition problems. It is hoped that such discussions will lead parents to possible solutions to health problems, as well as emphasize to them the importance of improving the quality, variety and productivity of their farms. The agroforestry scheme will be launched at this time, taking advantage of the new awareness of the link between farming methods and health and nutrition.

Community involvement. Since kaingineros in the area feel that the community extension services they received in the past did not help them solve their problems, they will be involved in planning, identifying problems and proposing measures related to farm production, forest conservation, fishing and livestock raising. Their involvement in goal setting, implementation and monitoring of the program should facilitate the acceptance of alternatives to shifting cultivation. Informal community meetings presided over by their perceived leaders might be scheduled during *tabu*, a day regularly set for the sale of products, community games and informal discussions.

Educational campaigns. Kaingineros in the area engage in traditional, below-subsistence farming and maintain low-intensity farm production. Any alternative model must meet the subsistence needs of farmers. Since upland farmers have mixed feelings about forest conservation, a mode of technical agricultural assistance with a built-in mechanism for the dissemination of ecological information must be devised. It is also important that farmers begin to adopt a systemic view of their farms in relation to other farms and components of the community, as opposed to the present singularistic concept of farm management .

Consideration of respondents' social and personality systems. Innovations have to be geared to the economic and cognitive levels of the target beneficiaries, and should take into account social and personality systems. At the initial stage of operation, implementors of the project must start with activities which are familiar to the farmers. Cropping practices are determined primarily by family tradition and are influenced by superstitions. Decision-making in the acquisition of tools and land, the use of fertilizers and the choice of crops to be planted are influenced by internal agents of change (parents, relatives and close friends in the community) rather than by external agents.

Selection of demonstration fields and nursery site. The choice of demonstration fields for the agroforestry model will be primarily determined by the owners' willingness to be directly involved in the project. Demonstration fields will serve as pilot farms for innovations in agricultural practices. A nursery site has to be decided upon by the kaingineros themselves, likely influenced by the accessibility of the area to the members of the group.

Off-community leadership training. The owners of demonstration plots are likely to be farmers who are open to the idea of adopting the agroforestry model. They can be motivated to effect some of the needed changes through trips to other places, like Cebu, where successful pilot projects in upland agroforestry exist. Such field trips might prove more effective than the more usual sending of extension workers appointed by the project.

Support of local leaders. The project will enlist the support of local leaders: the mayor of Sibulan town, the barangay captains in the area and other perceived leaders of the community. The provincial governor, the city mayor, BFD officials and others concerned will also be asked to support the project.

Linkages. The project will collaborate with political units which plan and carry out government policies on forest utilization and manage-

ment. These include the Bureau of Forest Development, the Bureau of Plant Industry, the Bureau of Animal Industry, the Bureau of Agricultral Extension and the Bureau of Fisheries and Aquatic Resources. Linkages with quasi-government and private institutions engaged in similar ventures may also be established. To study rainforest vegetation, for example, a collaborative undertaking with the Forestry and Botany departments of the University of the Philippines at Los Baños is currently being arranged.

Cooperatives. At a later stage, when farmers are producing above the level of household consumption, cooperatives may be introduced. These can take the form of marketing, consumer and/or credit cooperatives. Upland farmers presently have some difficulty in marketing their produce. For instance, chayote (*Sechium edule*), a major vegetable crop in the area, literally grows wild in the forest, needing minimal or no care at all by the farmers. But farmers do not earn much income from this crop because the absence of transportation facilities makes it difficult to carry to the lowlands.

Project Directions.

Year I of the Balinsasayao Rainforest Project was devoted to gathering primary data on shifting cultivation in the area as a basis for developing an upland development program for the kaingineros and at the same time saving the rainforest ecosystem from further destruction. Year II will attempt to implement the proposed program of action. The proposed activities for year II are outlined as follows: Health and nutrition activities will continue throughout the year. Mapping activity will be concentrated in the first two months. Approximately five months of social preparation will lead into presentation of the agroforestry scheme for the balance of the year.

In addition to these major activities, the research will continue. There is a need, for instance, to establish scientific meteorological data for the site. Demonstration fields require much research. For example, what are the most satisfactory tree-crop combinations for the area? How are major pests or diseases of crops to be resisted? Which farm practices will cause the least surface run-off, nutrient leaching and soil erosion, especially on cultivated slopes?

The other components of the model—forestry, fishery, livestock, cottage industry—also offer much room for research. In addition, beyond Year II an evaluation must be conducted to assess the project's achieve-

ments and to determine errors so that modifications may be made and alternative directions taken in response to changing demands.

A Step toward Implementation of the Model.

On 8 February 1983, Silliman University organized a conference of officials from the provincial governor's office, the Dumaguete City mayor's office, the Sibulan town mayor's office, the Bureau of Forest Development, the National Power Corporation and the Philippine National Oil Corporation. The latter two semi-government entities are engaged in the generation of power and are involved in watershed management. At the conference, alternatives to shifting cultivation were presented. These agencies represented gave their support to the project. Those involved with the project see this as a small, but nevertheless significant step towards realizing the goal of efficient management and utilization of upland resources.

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Biophysical aspects of the Balinsasayao project: An integrated report. Rodolfo B. Gonzales.

The forest and the kaingins in the Balinsasayao area. Emmanuel Bascug.

Profile of agricultural practices in the Balinsasayao area. Lemuel Montenegro.

Measures of soil fertility in the Balinsasayao region. Stephen Lowrie.

Survey of the vertebrate fauna of the Balinsasayao area. Ma. Louella Dolar.

The views and practices of upland farmers: An introduction. Betty C. Abregana.

The sociology of shifting cultivation around Lake Balinsasayao: A focus on decision making. Philips Munar.

The anthropology of upland farmers: The case of the Balinsasayao farmer. Rolando Mascuñana.

Assessment of nutritional status of residents at Lake Balinsasayao. Carmen Fontelo.

Assessment of health threats in the Balinsasayao area. Luningning Apostol.

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Notes

1. A preliminary profile by Keith R. Erickson and Paul D. Heideman of the Balinsasayao primary forest reported their suspicion that all rattans reaching about three to four meters in length are harvested by rattan hunters. Neither saw a rattan more than four meters long, nor did they see any rattan with reproductive structures during their field work. They suspect that these rattans are simply shoots growing from the bases of very old plants. Unless these are dwarf species, seeding at a small size, the rattans in this forest will become extinct as the plant bases gradually die. Heideman and Erickson stayed in the Balinsasayao area for seven months at the time this report was written, conducting an intensive study of bat ecology for Heideman's Ph.D. dissertation at the University of Michigan.
2. Paul D. Heideman, field notes.
3. The municipality of Sibulan presented to the Bureau of Forest Development a proposal that declared 3,880 hectares of land in the area of the study as a National Park. The proposal was formally endorsed by the BFD Director and is awaiting a presidential directive. The National Park scheme has no definite program for implementation.

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