ER 352 S01 Judith Lyn Arney
John Dick Directed Term Project
0136908

The Forest and the Field:

Non-Timber Forest Products and Forest Services in Agricultural Ecosystems

In 1989, the Food and Agriculture organization stated, "forests and farm trees provide critical support to agricultural production". Forest ecosystems provide food security directly and indirectly to agriculturalists, pastoralists and forest dwellers (FAO 1989; Shiva & Bedi 2002); in short, all societies benefit from the services forests provide to agricultural ecosystems. In this paper, I will explore two types of traditional agricultural systems and their use of forest services and non-timber forest products as well as their barriers to continued success: the Lacandon Maya practice of agroforestry in southern Mexico and the traditional agriculture of western Japan. Finally I will review some non-timber forest products and forest services in use in agricultural ecosystems here in BC, Canada and the challenges presented by agricultural policies and recent provincial tax assessments in maintaining the natural relationship between forests and agriculture. All three regions are pressured by similar forces, namely that of the conventional divide between the industries of forestry and agriculture, compounded by policies within each industry that serve a global economy and are deleterious to the integrity of food ecosystems and therefore the food sovereignty of the people in each area. Despite these pressures, it is evident that the forest provides valuable products and services to agricultural ecosystems.

Swidden Agroforestry in the Lacandon Jungle: Chiapas, Mexico

Swidden agroforestry systems around the world are described as resource management practices that "balance the goals of agricultural development with the conservation of soils, water, local and regional climate and, more recently, biodiversity" (Schroth et al. 2004: 2). The nutrient-poor soils of tropical rainforests require food production techniques that facilitate soil fertility; swidden agroforestry has developed over generations to surmount the challenge posed by rainforest soils and provide sustenance sustainably for forest communities living in the tropics (Singh, Pathak & Roy 1995: 267). Agroforestry management systems often produce comparable food volume per hectare as those of large-scale monocultural food production systems, without the costs of deforestation. Zhaohua (1995: 77) claims that agroforestry incorporates appropriate food chain links between species, namely using leaf litter as fodder for animals and fertilizer, which in turn nourishes the soil directly or indirectly through the excrement of animals. Leaf litter is an important factor in soil fertility. Excess removal of organic matter, combined with soil compaction and loss of bioregulation often found in conventional agricultural systems, leads to an increase in soil degradation (Perry 1994: 487). Agroforestry strategies employ soil regeneration techniques vital to tropical ecosystem resource management. In this way, the services that forest trees provide also benefit food production.

Chiapas is the southern-most province of Mexico, characterized ecologically by moist tropical rainforests, coniferous forest and moist montane rainforests; the Lacandon jungle (as it is commonly known) is actually a moist montane rainforest (de Jong 1995). The region is located in the eastern part of the state of Chiapas, between 16°05' – 17°45' N and 90°25' – 91°45' W, between the Usumacinta River and the Perlas and Lacantún rivers ("Lacandon Jungle"). The Mayans of the Lacandon jungle have traditionally practiced a form of swidden agroforestry consisting of five successional stages: a herbaceous stage (*kor* or *milpa*), two shrub stages (*robir* and *jurup che*, or described together as *acahual*), and two secondary forest stages (*mehen che* and *nu kux che*). A portion of their land is kept in primary forest (*taman che*) (Diemont 2006: 8). Lacandon agroforestry produces food substantial for community needs. These food items include onions (*Allium cepa*), papaya (*Carica papaya*), cilantro (*Coriandrum sativum*), chihua fruit (*Cucurbita spp.*), cherry tomatoes (*Lycopersicon esculentum)*, mango (*Mangifera indica*), cassava (*Manihot esculenta*), arrowroot (*Maranta arundinacea*), sugarcane (*Saccharum officinarum*) and, of course, corn (*Zea mays*) (Diemont 2006: 114). Additionally, total soil nitrogen and soil organic matter have been found to increase with each successional stage (Diemon 2006: iii). The Lacandon Maya are cognizant of strategies to increase soil fertility through residual organic matter (ie. leaf litter), inherent in agroforestry systems, as well as specific plant knowledge. The Lacandons consider over 45% of the plant species present in each fallow stage important for enhancing soil fertility (Diemont 2006: iii).

Separating forest and agriculture is clearly inappropriate when dealing with swidden management systems, yet both sectors threaten the autonomy of the Lacandon Mayans to continue managing their food ecosystems sustainably. Logging, both legal and illegal, has led to overexploitation and a departure from traditional management strategies (FAO 2002: 134). Additionally, large scale agriculture projects encroach upon traditional lands, often with subsidization from government (Roberts and Thanos 2003) The Lacandon Maya face overwhelming pressures due to poverty and social inequality: economic debt continues to plague Mexico and Latin America, dragging forest communities into the global economy as their traditional territories become enveloped by large scale industries (Roberts and Thanos 2003: 165-191). Perry (1995: 491) describes the problems that arise when communities practicing agroforestry do not have enough land base to allow appropriate fallow periods; soils do not have enough recovery time to support vigorous regeneration of plant communities typical of mature forests. This leads to habitat fragmentation and poor ecosystem integrity. Gutpa (1995: 268) asserts that resource management must incorporate socio-cultural traditions and values in order to be successful. For sustainable restoration of soils and agroforestry systems in the Lacandon jungle, the traditional resource management of the Lacandon Maya needs to be integrated into policy governing both the forestry and agricultural industries of Chiapas. Presently, the swidden agroforestry of the Lacandon Maya provides a model for sustainable use of forest services and non-timber forest products in agricultural ecosystems.

Satoyama: the Traditional Agriculture of Japan

In the spectrum of sustainable agriculture, agroforestry occupies a place in which the forest and the field overlap substantially. Other models of sustainable agriculture have more defined boundaries between wild and domesticated environments, yet maintain the vital principle of incorporating forest products and services with food production. On the Hirono grounds outside of Kobe in western Japan, researchers from Konan University currently engage in restoration of their traditional agriculture, *satoyama*. In Japanese, the written character for *sato* (里) means 'village', while *yama* (山) means 'mountain'. Hence the name *satoyama* represents the interplay between the wild and cultivated resources within itself.

Satoyama is not officially the traditional agricultural system of either of the two distinct indigenous groups of Japan, the Ainu in Hokkaido or the Ryukyu in Okinawa. Satoyama is, however, a very old and remarkable integrated ecosystem model in which forested areas, rice paddies, vegetable plots and fish bearing streams operate interdependently, providing sustenance for centuries of rural communities. Within the satoyama management system, oak (*Lithocarpus glaber*) and pine (*Pinus spp.*) forests were prevented from growing dense through regular harvest of wood products (Tabata). When satoyama was the dominant agricultural production method in Japan, leaves from the satoyama woodlands were collected as compost for the rice paddies. The river systems of satoyama, while vital for irrigation in the paddies, provided residence for dragonflies and fireflies, important pest predator species. The integrated ecosystems of satoyama also allowed for wildlife migration through its varied terrain. In his essay, *The Future Role of Satoyama woodlands in Japanese Society*, Hideo Tabata writes:

> A good example of the ecological interconnection in the biological community is provided by *Sophora flavescens*, which grew abundantly in grasslands and was used for thatching and pasture for domestic animals and *Shijimiaeoides divinus* which only feeds on *Sophora*. As grasslands decreased in area and number, the population of *Sophora* decreased and this butterfly has now become an endangered species. It is perhaps ironic that both these species now survive on the practice fields of the Japanese Self-Defense Forces (Ishii 1997).

Aside from the significant food resources of the rice paddies and vegetable plots, many foods were collected from within the forested areas of satoyama management systems. At Hirono it is possible to harvest *takenoko*, or bamboo shoots (*Sasa japonica*), leaves from the peppery *sanshou* (*Zanthoxylum piperitum*) and *hebiichigo*, or “snake strawberries” (*Fragaria sp.*), from the forests adjacent to the rice paddies.

Modern satoyama food production systems, such those on the Hirono grounds, differ from conventional agriculture specifically in the rejection of mechanization and chemical inputs (Amano 2007). Mechanization of rice production has had a deleterious effect on the integrity of rice in Japan. In the rice nursery, seedlings are produced in small cells at 32° Celsius, promoting the growth of germs. The tractors transport the seedlings into rice field and plant the seedlings in perfect rows across vast expanses of industrial rice paddies. However, in traditional satoyama agriculture, in which there is no tilling of the soil, the root stalks of the previous year's rice is left behind in the paddy, strengthening the soil infrastructure, reducing erosion and essentially providing the adjacent forest with a stable hydrological flow and decreasing the dangers of sediment and nutrient runoff (Amano 2007).

Unfortunately, Japan's recent industrial economy has radically transformed the natural environment once so revered by its people. Since 1945, a massive (and failed) reforestation program wiped out over half of all the native oak, pine and laurel forests of Japan for plantations of a European cedar. By 2001, the River Bureau had dammed or diverted all but three of Japan's 113 major rivers (Kerr 2001). Local agriculture collapsed as the youth moved to the burgeoning cities and today many farmers are simultaneously employed in *doboku*, construction, a fervent national industry which ceaselessly paves rivers, builds dead end roads into mountains and carves unnecessary highways into the countryside. Like the Lacandon Maya, Japanese farmers wishing to maintain a rural lifestyle are finding themselves crowded by the shoulders of industrialization. While Japan is over 43% forested, mostly due to mountainous terrain (Kerr 2001), urbanization, pollution and soil erosion on the flatlands represents a considerable challenge to the restoration of satoyama management systems.

BC: Small Farmers and BC Tax Assessment Policy

The model of *satoyama* in Japan demonstrates the gains of integrating forest ecosystems and agricultural ecosystems to the benefit of both native biodiversity and food production, while the Lacandon model of agroforestry demonstrates the salutary effect of cultivating native flora directly within agricultural ecosystems. Yet in British Columbia as well as Japan and Mexico, conventional farming is far more dominant. Despite this, many small farmers survive throughout BC, adhering to principles of sustainable agriculture and organic farming. The value of forest services is becoming increasingly recognized within this group. Among other services, wild relatives of domestic food plants have been found to provide valuable genetic material for food crops (McNeely & Scherr 2003: 14). Wild birds that make their home in the forest prey upon insect pests and pollinate farm plants (McNeely & Scherr 2003: 14, Pollan 2006: 224). Additionally, forests on farmlands provide wind cover for herbaceous food plants in the fields, and also offer forage for small livestock (Pollan 2006: 224). As for food plants, many species of berry are often propagated from cuttings and cultivated on the farm, as in the case of blueberries, blackberries and raspberries. As well as intentional cultivation of forest species, the current high economic value of salal (*Gaultheria shallon*) and pine, morel and chanterelle mushrooms provides incentive to farmers to conserve forests on farmlands. Still, monetary gains are not high in the small farming business (Moneo 2007).

BC Agriculture is described as a sector at risk. Wendy Holm (1999: 2-3) identifies several reasons for the increased challenges that BC farmers experience, including:

- Elimination of farm subsidies (in BC, the most significant program cut was farm income insurance)
- Reduced commitment to defend farmers against dumping (Canadian Import Trade Tribunal)
- High-cost farming. Urban pressure from rapid population growth combined with BC's valley bottom topography - prime farmland and prime development land are one in the same – has resulted in highly speculative prices for prime farmland (at $35,000 to $50,000 an acre, orders of magnitude above farm prices)
- Canada supports its farmers less per capita, per hectare or per full time farmer equivalent than any other OECD nations with the exception of Australia and New Zealand. The rest of the world is quickly moving to replace old-style market distorting subsidies with environmental subsidies - green subsidies - which support the positive externalities of sustainable farm management practices.

While these pressures continue to subject BC farmers to the whims of a global market, the BC Assessment Agency (BCAA) has made it very difficult to integrate forest and agriculture ecosystems on farmland not protected by the Agricultural Land Reserve. On farms throughout the province, all land not currently under agricultural production is subject to being rezoned as residential in a split tax designation (MacLeod 2008). Already farmers in Saanich have plowed under forest portions of their properties to create an appearance of ‘production’ that will satisfy the BCAA (Cardone 2007). Under this new tax assessment policy, 204 farms in the municipality of Saanich were reviewed and twenty-two had their farm status revoked to the extent that their annual taxes increased over 200 percent (Cardone 2007; Macleod 2008). Unfortunately, provincial agricultural policy in BC threatens the existence of forests on farmlands despite the importance of forest retention.

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In her essay, *Monocultures of the Mind,* Vandana Shiva (1993: 4) argues “the monoculture of the mind is best illustrated in the knowledge and practise of forestry and agriculture. `Scientific' forestry and `scientific' agriculture split the plant artificially into separate, non-overlapping domains, on the basis of separate commodity markets to which they supply raw materials and resources”. In each of the regions described here, sustainable food production systems face challenges from a powerful ideology that divides the forest from the field. The FAO (2002: 153) has confirmed that in forestry, sustainable harvest is a successful conservation strategy, and the benefit to agriculture of forest ecosystems has been here elucidated. While significant challenges to the retention of forests on farmlands exist, it is clear even through these three examples of differing agricultural systems that non-timber forest products and forest services have an important role in the food production capacity of agricultural ecosystems.

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