

*Cutting the Ground from under Them?
Commercialization, Cultivation, and
Conservation in Tonga*

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This paper draws together a number of social and environmental factors involved in the increasing commercialization of cultivation in Tonga.¹ It is based to some extent on my observations, but also relies heavily on the work of others. Most of the information I present is already available in published sources, but many of these are not in wide circulation, nor do they always make explicit the connections between social and environmental factors. Social scientists tend to dwell on the familiar tale of migration and its consequences for people left behind, and make only brief allusions to the repercussions upon land use and agricultural practice (James 1991; Gailey 1992). Agriculturalists, economists, geographers, and soil scientists, on the other hand, have looked at changes in patterns of agroforestry and the depletion of resources but make only passing references to the people who control and work the land.

What is missing from both kinds of scholarly endeavor is any extended discussion of the relationship between the social factors and the patterns of environmental change. The sort of connection I have in mind may be illustrated by a common scenario in present-day Tonga: a customary landholder moves to town or goes overseas to seek waged labor, leaving his plot of land, his *'api tukuha'u* or tax allotment. Other men who have no land try to use the absentee's allotment by formally leasing it or, much more commonly, by entering into informal arrangements that are insecure and brief. Both kinds of agreement can cost the user thousands of pa'anga (Tongan dollars).²

Commercial farming is often the only way to get a realistic return on the high costs of leased or "borrowed" land. As a result more harvests are taken than is usually the case in the traditional system, different assemblages of crops are grown, fallow periods are shortened, and the type and quality of revegetation are reduced. In addition, mechanical tillage has reduced the number of trees and increased the breakdown of the soil structure. The loss of trees reduces the amount of organic matter available to the soil and has introduced problems of maintaining soil fertility, as has the increased use of biocides. Fewer fuelwoods are now available, and also fewer native trees, which have a range of special uses.

Despite these changes it is only slowly being realized that the altered cultivation practices may lead to environmental problems (Tonga 1991). Agriculture in Tonga is not centrally controlled, even though it involves 70 percent of all households, provides 75 percent of all export products, and is by far the most important use of the nation's scant 669 square kilometers (about 165,262 acres) of usable land.³

The lack of governmental overview is associated with the extreme fragmentation of independent landholdings. Production is mostly by smallholders who have considerable freedom of choice over the use and management of their land. Relatively little land is in large-scale commercial production. Some churches are farming land in a "plantation mode," but few commercial holdings in private hands are as large as 25 acres (Ramanlal 1990, 80).

The independence of individual customary landholders undoubtedly has fostered among them a vigorous entrepreneurial spirit, which still manages to exist for the most part with a carefully nurtured and deeply felt loyalty to the leaders of church and state. The ever-increasing need for cash makes growers keen for commercial profits. When bananas and copra ceased to be lucrative cash crops for export in the late 1980s, farmers turned more to root crops, vegetables, vanilla, and watermelons. Most spectacularly, the cultivation of pumpkin squash earned Tonga T\$15 million in export sales to Japan during 1991-1992.

Although most men are still allowed to grow subsistence crops on parts of "family land" (that which belongs to their father or elder brother), they face increasing difficulty in getting access to land of their own on which to grow cash crops. The relative shortage of land for commercial purposes

raises the value of the land that is available and heightens the pressure to produce more from each agricultural unit.

Paradoxically, Tonga now faces a shortage of land for commercial purposes while thousands of fertile acres lie apparently idle. Much of the explanation for this can be found in the land tenure system that was devised in the nineteenth century for a much smaller population of subsistence horticulturalists, and has continued to be applied with little alteration to a growing and highly mobile population in an increasingly monetized economy.

THE "CASH IMPERATIVE"

Tongans sometimes complain, "Today, everything is money. In the old days people gave things." But cash is probably used more often today to attain cultural ideals than to subvert them. Cash is needed to fulfill traditional obligations and to "be Tongan." Generosity to nobles, to those of higher social rank, and to kin is highly valued. These signs of respect were reaffirmed and reemphasised in the first half of this century by Queen Sālote and have become an important part of "being Tongan."

Western items, especially foodstuffs and cigarettes, are now essential parts of "traditional" ceremonies, prestations, and exchanges. Cash is now used also to buy the mandatory items of traditional wealth, such as mats and decorated barkcloth, and to recompense or thank the helpers for their customary labor services. Large amounts of cash now change hands at weddings and funerals "to cover expenses," which include air fares for important guests or mourners, appropriate gifts, and clothing. Accordingly, it is not the rural cash-poor but more often their more prosperous, cash-rich, urban kin who are the mainstays of the traditional ceremonial system.

Tongans know they are criticized by development experts and others for spending too much on feasts and deferential display, but they say, "This is what makes us Tongan; this is what we do." It is a "self-consciously preserved orthodoxy that sustains cultural identity" (Marcus 1989, 189). The recognized social forms remain "an important anchor for Tongans as they travel internationally, go abroad for long periods as migrant workers, and as they become consumers of Western goods and imitators of Western lifestyles to an unprecedented degree at home. . . .

These values establish specific cultural boundaries in the face of an ever greater penetration of Euro-American worlds" (Marcus 1989, 190-191).

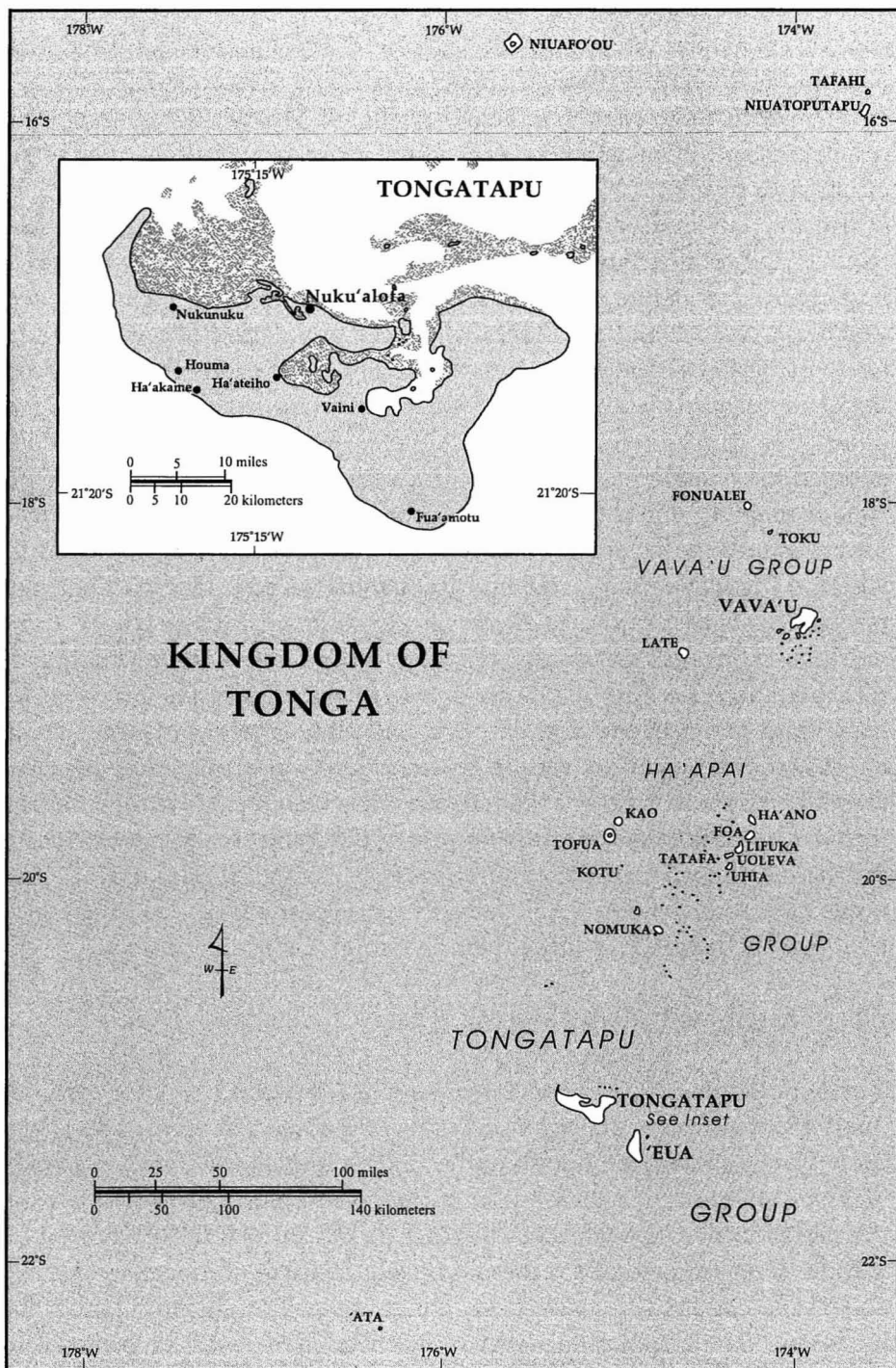
LAND TENURE, POPULATION, AND MIGRATION

The predominant patterns of Tongan landholding are described fully elsewhere (Lātūkefu 1974; Needs 1988; Campbell 1992). Residual title to all land in Tonga is held by the Crown. In practice, land is divided into estates (*tofi'a*) that are controlled by the government or by the thirty or so currently held noble and *matāpule* (ceremonial attendant) titles, which include some male members of the royal family. The system legally entitles every male of sixteen years and over to apply for a rural tax allotment and a town allotment from his chief's estate. Once the plot is registered, the leasehold becomes perpetual, inheritable by the eldest son forever, so long as taxes are paid to the government and rent is paid to the noble.

The rural garden allotments (*'api tukuha'u*) were to be 8.25 acres (3.34 hectares) in size, except in densely populated parts of Tongatapu, such as Hihifo, and the small islands of the Ha'apai and Vava'u groups (see map). Where land was less abundant, holdings were reduced to between 3.00 acres (1.20 hectares) and 6.00 acres (2.40 hectares) and sometimes to just 2.00 acres (0.80 hectare). Town allotments were uniformly 30 poles (0.40 acre, 0.16 hectare). Because of the growth of the male population, however, the proportion of eligible males who can acquire garden allotments in their own names has been continuously reduced.

THE PRESSURE ON ARABLE LAND

The difficulties of acquiring land, particularly for commercial farming, have been increasing steadily. More than twenty-five years ago, Alaric Maude noted the inability of increasing numbers of men in Tonga to acquire tax allotments for cultivation, and the consequences of more intense cropping (1965). He noted various informal arrangements by which men borrowed land from relatives for the cultivation of subsistence crops, for which no direct payment was made, and the borrowing of land from others when it was customary to give a small part of the crop to the leaseholder. He noted also the growing number of illegal cases in which a cash payment, or gifts of crops and pigs, was given for the use of land. Similar difficulties in borrowing land for commercial production (al-



though small amounts could be borrowed for subsistence) have been observed elsewhere in Tonga (Rogers 1975). The pressure within the system to which these trends pointed, concluded Maude, was as much the result of the growing commercialization of Tongan agriculture as of population increase alone (Maude 1973, 174).

More recent studies of the same areas on Tongatapu studied by Maude have tended to bear out his findings. Surveys conducted in the villages of Nukunuku, Ha'akame, and Ha'ateiho showed that there were more males without access to land in villages where the population density was relatively low (below 150 persons per square kilometer) and where landholdings had been consolidated and were large, than in villages with higher population density where a more equitable distribution of smallholdings allowed men access to subsistence production (Needs 1988, 55). In 1960, Maude had found in the village of Nukunuku that 51 percent of male taxpayers who were legally entitled to land were without access to land. In addition, the per capita income of households without land was half that of households with full-sized allotments (Maude 1973, 173-174).

Much of the information that documents the changes since Maude's initial observations is partial. But it appears that the processes he saw as the beginnings of a problem in the control and management of land in Tonga have, without regulation, simply grown in scale and complexity. Deterioration in the social fabric of the kingdom may well be matched by increasing environmental deterioration unless land in Tonga is allocated so that it can be used more equitably and effectively. Agriculturally active households need to produce a surplus, either for sale or gift, to feed the households that do not now produce their own food (Delforce 1988, 29).

POPULATION AND MIGRATION

The population of Tonga more than trebled between 1931 and 1976, the numbers of people rising from an estimated 27,700 in 1931 to 90,085 in 1976. Tonga's resident population has been significantly limited in recent years by emigration, which has kept the total number of people roughly the same for almost two decades—from 90,085 in 1976 to 94,649 in 1986, and down again to 90,485 at the end of 1989. But emigration does not necessarily free up land, because many emigrants still legally hold land rights in Tonga. The population density thus has risen from 41 persons per square kilometer in the 1930s to more than 135 persons per square kilome-

ter of total land area today (Dutta Roy 1982, 6, 9). The land situation is exacerbated because some of Tonga's land mass is uninhabitable (see note 3).

In 1966, it was estimated that only 42 percent of eligible men held garden land; by 1976, the proportion had fallen to 35 percent. By 1986, only 25 percent of eligible males had land registered in their names. In other words, by the early 1990s, 75 percent of those who were eligible for land had none. Furthermore, most of these men, frustrated growers, now live in the most densely populated main island of Tongatapu at the southern end of the Tongan archipelago.

Tongatapu has almost 70 percent of Tonga's population, about 65,000 people, in an area of 257 square kilometers. In the late 1980s, 37 percent of households in Tongatapu did not grow or produce agricultural products. Not surprisingly, the highest percentage, 56 percent, of these nonagriculturally productive households was located in Nuku'alofa. Yet, the population is most dense in western Tongatapu, having risen from 210 persons per square kilometer in 1971 (Maude 1973, 167) to about 246 persons per square kilometer today. Even allowing for the pattern of shifting cultivation, only about 37 percent of all Tonga's arable land may actually be cultivated (Tonga 1991, 25). In Tongatapu alone, perhaps more than 10 percent of all registered allotment holders have gone overseas (Sevele, quoted in Campbell 1992, 216).

In 1991, People's Representative 'Akilisi Pohiva unsuccessfully organized a petition asking the king to rescind leases held by people who had emigrated. Legally, tenure is dependent on the fulfilment of a number of strict conditions that include maintaining the allotment in a "reasonable" state of cultivation, and not "abandoning" it for more than two years, but sanctions against neglecting land are not usually applied. Recent attempts to induce absentee landlords to release their land, such as by imposing penalty taxes, have met with government resistance, mainly because of the fear on the part of those at home that goods and money remitted by these same absentee landlords might cease if their land rights were removed.

The increasing scarcity and value of available land in Tonga have made senior kin more reluctant to provide land for younger, lower-ranking kin, even for subsistence needs. Informal access to land for commercial agricultural purposes has thus become more difficult at the same time as the desire for cash has become more acute. The country's leaders prefer to blame noncultivators for unused land. For example, the king suggested at

the opening of the Vaheloto Agricultural and Industrial Show in Tongatapu, in October 1991, that too much valuable farm acreage around Vaheloto in the center of Tongatapu was unused.

The district contained 1984 bush allotments covering 15,871 acres (6425 hectares), with an average size of almost 8 acres (3.2 hectares), 80 percent of which were lying idle. Because the report does not distinguish between uncultivated land which was abandoned and that which was lying fallow, a figure of 20 percent of land cultivated at any one time in any one area does not clearly indicate the problems.

In the same year, outgoing Prime Minister HRH Tu'i Pelehake, the younger brother of the king, remarked in a final interview:

There is still a lot of uncultivated land around the place. In Tongatapu alone there are about 10,000 registered tax allotments. About two or three years ago when we were trying to revive the banana industry, there were less than 2000 growers who were interested. What is happening to the rest? So it is difficult for us to say that landlessness is causing the poverty of the people. The same question can be applied to the squash growers. There are only about 1000 squash growers, but what happened to the rest? (Fonua 1991b, 15)

The short answer is that the majority of potential growers are unable to find secure tenure or cannot afford the high price of leasing a piece of garden land. The only advice that the minister of Lands offered in 1991 to men who had no land was, "to work hard and accumulate some money to buy land" (quoted in Fonua 1991a, 16). Ironically, as a result, many Tongans go overseas to earn enough money to buy their way into land at home.

THE NOBLES' CONTROL OF LAND

Another cause of land shortage, one that raises bitter controversy, is the reluctance of some nobles to relinquish legal control over their lands by allowing eligible applicants to register allotments. By the early 1970s, nearly 30 percent of land was still designated as nobles' estates and most of the land that *was* registered had been allocated from government estates. Plots on government land are fairly readily secured by a simple registration procedure at the cost of only a modest administrative fee. But land deals with individuals almost always require "facilitation" by extra-legal cash payments.

Between 1973 and 1974, the government, composed largely of nobles, altered the statistical appearance of the extent of nobles' land. Of the 27 percent of all land in Tonga categorized until then as "hereditary noble estates," 20 percent became "allotments not yet registered but already allocated." Commoners were often paying money and gifts in kind for years to the nobles for the use of land they allocated, but the would-be tenants' position was not legally tenable and could be terminated at the nobles' wish. The land remained a major source of the nobles' power and of revenue from the applicants for registration of allotments.

Nobles are not the only land brokers because commoners also have been able, since the late 1970s, to lease customarily held land. But the nobles are the more powerful landlords and have been known to abuse their privileges of rank. On nobles' land, registration of users' plots can be withheld for years and cost up to T\$10,000, even after numerous gifts have been given annually to the noble estate-holder. These gifts have sometimes openly been called "bribes" (Hardaker 1975, 68). Nobles have even admitted that they know of cases of exploitation (Ma'afu 1975, 2). Popular perception of abuses may well be an exaggeration of the number and severity of actual cases; clearly, though, Tongan law is broken often in the matter of land allocation, particularly from noble estates, and everybody knows about it.

How many people have tried through the traditional medium of the "Kava" and the "Umu Puaka" (large pig) but still failed to persuade nobles to grant land? Has there been any land taken away from a Tongan currently occupying and utilising the land and given over to be leased by the Noble to someone else? Would we not therefore be justified in saying that today, a rich man gets land much more readily and easily than a poorer person? (Fifita 1975, 39)

Nobles lease some land to commercial interests, which returns them rent monies and also great influence in the commercial sector. Some further 2000 acres of noble holdings are nonarable but still valuable, because they lie on the 'Eua plateau which has considerable potential for forestry development.

In sum, almost all the arable land in Tonga is now allocated. Registered tax and town allotments, including the land allocated but not yet registered, account for 62 percent of the total land area. Nobles hold almost 7 percent as their estates, although only 2 percent of this land is suitable for agricultural purposes. Another 22 percent belongs to the government, but

this consists mostly of uninhabitable land, including forest reserves, volcanic islands, lakes, and internal waters. The remaining 9 percent of the kingdom's land is held under lease by companies, non-Tongans, quasi-governmental institutions, churches, and schools.

A Royal Land Commission was formed in May 1983 to review the land laws and to recommend changes to suit the times. Evidence was heard from hundreds of Tongans, including many women who suffer hardship because they are not allowed the same, albeit practicably unobtainable, land rights as men. The findings of the commission, which took many months to collect and cost thousands of pa'anga, have still not been made public, nor has the basic issue of the reallocation of Tongan land been addressed. Instead, independent entrepreneurs have largely taken matters into their own hands in order to acquire land for commercial purposes.

THE GROWTH OF THE LAND MARKET

The land legislation of 1882 was designed expressly to prevent a market in land in Tonga. But the shortage of land for eligible males has resulted in some amendments to legislation. The most important have been those of 1976 and 1978, which permitted the leasing of customary allotments. The maximum leases for town and tax allotments are now ninety-nine years for a town allotment of between 30 perches and 1 rood 24 perches (0.2 and 0.4 acre), and twenty years for tax allotments not exceeding 10 'api (a total of 80 acres or 30.3 hectares).

Major problems remain because of the small size of holdings and the relatively short periods of leases. Developers want formal leases, and banks require leases before granting substantial finance or mortgage on a property. But the titleholder may not wish to enter into a formal lease because he or his heir effectively loses control of the land for the period of the lease. As a result, informal leasing arrangements are more common, whereby the user pays the customary landholder a rent in cash or kind. These arrangements can be easily revoked or changed, however, and are often subject to disputes if the landholder suddenly wishes to use his land for other purposes, or to let another person use it.

The arrangements are not legally binding since they are not registered with the Ministry of Lands. Accordingly, the land user has more to lose than the customary holder since he cannot be assured of his tenure or plan his investment properly. The lack of formal leasing agreements is hardly

conducive to regulated private-sector development. One result is that very little capital is put into land either by the landholder, who is not using it, or by the user, who has no security of tenure.

An agreement to "lend," "sell," or lease a piece of land can be made only if the lessee or "borrower" is of Tongan birth. (Some Europeans have leased or "borrowed" land from Tongans to build houses, which have become the legal property of the Tongan landholder.) The two parties agree on a price on the basis of supply and demand. The money is presented to the landholder as a gift for his kindness in giving his land, which should subsequently be registered in the name of the new holder. Any such land deal may take many months and cannot be finalized until approved by the legal heir to the land. In the past, a father has "sold" land without the consent of the heir overseas, who returns to find nothing left for him (Fonua 1991a, 18).

THE RECLAMATION OF MARGINAL AREAS FOR URBAN PURPOSES

The quest for urban land illustrates vividly both the growth of the land market and the degradation of the environment. The greater Nuku'alofa area has grown rapidly over the last fifty years because of migration from the outer islands and from rural Tongatapu. The capital now contains almost 30,000 people, representing almost half of the people living in Tongatapu, and about 30 percent of the country's total population.

The "price" in total lease money and gifts for a town allotment may vary from the T\$150,000 asked, rather optimistically, in 1991, for a ten-year lease on 30 poles (0.12 hectare) of a long-vacant site in central Nuku'alofa, to around T\$30,000 for a fifty-year lease on a suburban site. The size of town allotments in new subdivisions has sometimes been reduced from 30 poles to 15 poles, and tax allotments can be subdivided to as little as half a hectare.

The government is reserving the little urban land it has left for industrial development, and has no more land to allocate for residential sites. After Cyclone Isaac destroyed much of Nuku'alofa in 1982, the government was forced to relocate people to a swampy part of Sopu, on the capital's western margins, and to Popua, another swamp area to the east. Since then, other "squatter" settlements have sprung up in both places, despite experts' repeated warnings that "the swamp environment is unsuitable for human settlement" (Nor 1982, 11). The areas are breeding

grounds for disease-carrying vermin, are inadequately drained, and used for dumping garbage. Poor residents, who have moved from the outer islands to the capital looking for money and jobs, often use the garbage for in-fill on which to build.⁴

The land was reclaimed from two lagoons, Sopu and Puke, which were cut off from the sea by the construction of a seawall and a coastal road. In addition to the destruction of these two lagoons, the aquatic assets of the town's still-functioning lagoons, Fanga'uta and Fangakakau, are also being damaged. Although they were made "protected areas" in 1974 under the Parks and Reserves Act, the construction of houses, manufacturing premises, nightclubs, and a large school on their edges over the last fifteen years has destroyed large areas of mangrove forest vital to the lagoons' well-being. The landfill used is insufficient in any case to avoid flooding during storms or unusually high tides. Property has been lost, and sewage frequently overflows causing smells and severe health hazards from the repeated flooding of pit latrines and septic tanks (Tonga 1991, 27).

Both lagoons supply foodstuffs for Nuku'alofa and villages scattered along their shores. The increased numbers of urban people are also over-exploiting fish, crustaceans, and invertebrates within the reef areas facing Nuku'alofa by the use of new technology and destructive practices. It is not only poor people who glean, but also members of "middle-class" families, who prefer to spend their limited cash resources on purposes other than food. As a result, the reef ecosystem is being depleted, and habitats of various species of marine life are rapidly being destroyed in the absence of effective coastal-zone management.

Land zoning in Nuku'alofa is equally haphazard because the land has all been subdivided and registered, "sold," and re-leased, in the absence of town-planning regulations. Attempts have been made to rezone the use of town land, but the plans were not passed when noble landowners and developers objected. As a result, churches, schools, houses, and industrial sites are juxtaposed. Residents complain about the constant noise from hotels and clubs adjacent to their homes. The king, with the consent of the Privy Council, can retrieve land from any holder for public purposes. This prerogative has frequently been used to exacerbate rather than relieve the consequences of unplanned growth and development. Indeed, some government agencies may be the worst polluters of all (Tonga 1991, 3). Waste disposal has become a major problem. Beaches have been denuded of sand for building, and the quarrying of stone is leaving unsightly local hazards and shortages.

THE EFFECTS OF COMMERCIAL AGRICULTURAL PRACTICES

The Tongan farming system is essentially an agroforestry system of bush or grass fallow with cultivated coconut palms or other useful trees creating a multilevel overstory. The staple root crops are yam, taro (*Colocasia esculenta*), sweet potato, cassava, *kape* (*Alocasia macrorrhiza*), and *talo Tonga* (swamp taro). Tongans are rightly proud of their system of agriculture, but have a tendency both to idealize it and to take it for granted.

Traditionally, Tongan farmers follow "swidden agriculture" which is short periods of cultivation followed by bush fallows to allow soil to recover. There is an intimate knowledge of local names for soils and their characteristics during fallow stages. Intercropping is the normal practice. Intercropping with rotational farming protects the soil, reduces clearing and maintenance work, reduces the risk of disease affecting a whole garden and spreads the harvest period for the garden. Intercropping between coconut trees further shelters the soils and protects the plants during storm periods. Tools and farming techniques are simple, utilitarian and inexpensive. A large effort is required during planting and the work is generally shared by many people (the *kautaha*). After initial efforts, gardens become highly productive in relation to labour inputs. The 'apis of Tonga have been worked for thousands of years. Their continued high rate of production and fertility in most areas are testimony to the sound environmental strategies of traditional agriculture. (Jim'enez and Tongilava 1990, 3.12)

Not all of the traditional practices, however, are uniformly beneficial. The widespread practice of burning to remove unwanted vegetation at the end of the fallow period depletes both potassium and nitrogen—soil nutrients that the fallow has replenished (Orbell 1971, 128). The practice of burning marks the trunks of coconut palms and discourages secondary tree growth, spreading the bare *sa'afa* (*Panicum maximum*) grasslands that are particularly evident in central Tongatapu in the areas of Vaini and Fua'amotu (Thaman 1984, 4).

Intercropping provides protection for the soil and reduces the need for weeding. But the traditional rotation of crops relates more to the requirements of favored tubers than to the preservation of soil fertility (Maude 1970, 59). Yams are planted first, because they require a loose soil well supplied with plant nutrients, while sweet potatoes, taro, and cassava can be planted on land that has already been cropped.

Some export crops have been grown as an integral part of the bush fallow system as advocated by agricultural advisers (Tonga 1991, 3). Bananas

were frequently planted as part of the cropping sequence as well as in separate plantations when they were a major export crop, before the change in New Zealand's import policy in 1990 removed preferential treatment given to bananas from the South Pacific and ruled out the Tongan product as an export commodity.

Coconuts as a long-term tree crop were never cultivated as part of the bush fallow system, but were unevenly scattered over part or all of each allotment. The palms tended to shade the crops planted under them and reduce yields. Consequently, the farmer rotated gardens around the trees. The trees and crops competed for soil moisture and nutrients, trees were damaged by the practice of burning off to clear the land for replanting, and crops become entangled with fallow vegetation.

In some areas, such as Ha'apai and western Tongatapu, land shortage and a desire for income from copra in the 1960s led to a complete areal merging of food crops and coconut palms, though with a fairly open spacing of the palms to allow sunlight to reach the crops planted below. The widespread planting of coconuts, particularly after the Coconut Replanting Scheme began to have significant effect on Tongan agriculture in the 1970s, meant there was less land suitable for yam growing. Many growers were unable to afford the long fallows considered necessary to produce the right soil conditions for the tuber. Cassava, on the other hand, is an easy tuber to cultivate and more resistant to drought than the other staple foods available. It gives good yields even on heavily cropped soils, and does not require a lengthy fallow. Dryland varieties of taro, like cassava introduced to Tonga only in the nineteenth century, have also increased in popularity because they can be replanted several times. In some districts the cultivation system is intensive for shifting cultivation, with a ratio of cropping period to fallow period of 1:1, or less.

While coconut products and bananas have declined as exports, since the late 1980s exports of yams, taro, cassava, and *kape*, particularly to Pacific Islander migrant communities in New Zealand and Australia, have grown significantly. These export crops can be grown as part of the agroforestry system. But commercial farmers and semisubsistence growers with an eye to making money are keener to try monocultures, such as vanilla, which is grown mostly in the northern island group of Vava'u, and pumpkin squash (the variety of Delica, *Cucurbita maxima*), tons of which have been produced in Tongatapu in the last five years.

Monoculture on a large scale requires radical changes, including the

clearing of large areas of land in order to plough and harrow, weed and fertilize. But the effects of these changes are barely noted. One recent report remarked briefly that "new technology is being introduced and accepted in an alarming fast rate and traditional methods are unfortunately being put aside" (Jim'enez and Tongilava 1990, 3.12).

THE DECREASING NUMBER OF TREES

Tongan growers did not plant trees in the old system of agroforestry. They selected the trees that would remain when they cleared their gardens for cultivation, and allowed trees to spontaneously regenerate in the long fallow periods that they maintained. These practices resulted in high tree densities for the relatively low numbers of people who made great use of their fruits, nuts, leaves, and bark for ornamental, medicinal, and other purposes.

Shorter fallow periods have altered the type of revegetation. The secondary growth that springs up in areas of intense land use now consists mainly of grasses and other herbaceous plants, and shrubs such as lantana and guava. Only where the fallow period is four years or longer do trees such as beach hibiscus or *tavahi* become established.⁵ The present tendency is to keep trees only as a border to the *'api* rather than leave them scattered throughout the plot. Many areas now are covered only with grass or scrub, degraded, and almost devoid of native trees except for the usual coastal and strand vegetation.

Ploughs topple young trees in their path and destroy seedlings, and mature trees are deliberately felled to make way for tractors. Farmers, who lack the labor for weeding around trees, resent the proliferation of newly introduced weeds and grasses. When they can afford it, they use herbicides rather than the hoe to remove weeds,⁶ a practice that also kills off any spontaneously regenerated tree seedlings.

Much of the destruction of trees is unintentional, but some unique stands of forest have been deliberately felled to make way for modern facilities. The construction of runways at Fua'amotu International Airport entailed the cutting down of nearby coconut plantations to create airport approaches. Many trees were destroyed, for which their growers received only belated compensation. A similar mercenary attitude toward trees was shown when a stand of well-developed indigenous trees was cut down in 1989 for the extension of the main runway. The trees were part of the last

remaining stand of natural forest on Tongatapu and stood in an area of almost thirty acres, which had been designated in 1986 as Va'omapa Terrestrial Park. Much of the forest was withdrawn from the park in 1987 because the noble on whose estate it stood was not offered enough money by the government as compensation for his trees. Later, for a more adequate financial consideration, he let the aviation authority simply destroy the trees.

Farmers are aware that many trees are less common now than before; but they rarely connect their perception of the loss of numbers and types of trees with their accurate perception of declining yields and soil fertility levels.⁷ Growers have notably more negative views of trees when they have access only to relatively limited land, which is not registered in their names. Temporary lessees tend to fell trees and clear coconut groves to allow for greater cash-cropping, and the trees often are not replaced when the land is returned to the customary holder. Farmers with larger areas of land registered in their own names, however, tend to maintain longer fallow periods and still preserve trees as part of the horticultural system. The numbers of crop species and tree species are roughly equal to one another and consistently higher on land that is securely registered in the grower's name (Kunzel 1989, 13, 27–28).

Unhappily, many trees with specialized uses are fast disappearing from the landscape. *Ahi* (sandalwood) has been exported in large quantities, causing this valuable wood to be in short supply for local woodcarvers. Red cedar, *koka* (*Bischofia javanica*), which yields dye for decorating barkcloth and also makes excellent firewood, is vanishing because of widespread clearing for tillage, and because of the overuse of the few trees that are left. Mangroves are also being depleted since a mangrove species, called *tongo* in Tongan, provides an alternate source of dye to *koka*. *Hiapo* (paper mulberry, *Broussonetia papyrifera*), the raw material of barkcloth, often has not been planted in Tongatapu because male growers say that it makes the land "bitter" and unsuitable for the production of high quality food crops. With the increasing pressure on arable land, women sometimes plant *hiapo* around their houses for themselves and also as a cash crop. The bark, stripped and prepared, finds a ready sale at the market to clothmakers who have no access to the raw materials, or lack the time to prepare them. The commercialization of agriculture might be contributing in this way to an increase in women's manual labor, as well as to the commercialization of women's handicraft production.

FUELWOOD

The loss of trees has further implications for domestic labor, at least in the short term, since the more desirable fuelwoods of the past have become increasingly difficult to find, and most people gather firewood. Wood is still by far the most important source of fuel in Tonga; the annual demand for fuelwood in Tongatapu alone has been estimated at 97,000 tonnes, about two thirds of which is for household consumption. People have to travel farther afield to gather wood, or pay increasingly high prices for it at the market.

The favorite fuelwood species are those generally found in inland or swampy coastal or littoral native forests.⁸ The next most favored fuelwoods are generally found in secondary forests or treed areas on bush allotments.⁹ Other very important fuelwoods include the weedy pioneer species that now tend aggressively to monopolize fallow areas on tax allotments.¹⁰ As wood becomes scarcer, people will increase their use of parts of the coconut tree, poorer quality woods, shrubby weedy species, timber offcuts, sawdust, and hedge plants.¹¹ People may cut farther into inland, coastal, and mangrove reserves. Already supplies of coconut leaves, husks, and shells are becoming scarcer in urban areas contributing to a decline in the use of the traditional earth oven (*'umu*), although baking is culturally important and nutritionally better than boiling food (*haka*). Urban dwellers are becoming more dependent on imported foods, which require little or no cooking, and on higher-cost imported fuels.

Although Tonga is not yet facing major shortages in the supply of firewood, the rapid removal of slow-growing trees from the Tongan landscape must mean shortages of fuelwood in the future unless steps are taken to replant them. Certainly, the loss of trees must further affect soil fertility.

SOIL FERTILITY

Tongan soils are derived predominantly from an andesitic volcanic ash mantle overlying coralline limestone platforms. They are friable, well structured, well drained, and have a moderate water-holding capacity. They range from slightly acid to slightly alkaline, with high levels of calcium and magnesium, a high cation exchange capacity, and high base saturation (Potter 1986). Despite an estimated doubling of cropping intensity

over the last fifty years, the most important element in the traditional system, that of maintaining soil fertility through fallow, has hardly been improved. Indeed, long fallows are becoming progressively more rare.

Fallow periods of less than four years were the average in districts close to Nuku'alofa a generation ago (Maude 1965, 137). By the 1980s, almost 50 percent of a sample of farmers reported reduced fallow periods because of their intensified use of land, particularly on Tongatapu (Kunzel 1988a). Now, shorter fallows are reported even on small outer islands, such as Kotu in the Ha'apai Group (Perminow, forthcoming).

A study of soils in 1985 found evidence of deterioration in the nutrient status and physical condition of soils, particularly in their water-holding capacity. The study related this to current management practices, but the more important factors overall in the maintenance of the quality of soil appear still to be the site (the village or area of cultivation) and its basic soil type. Different sections of a Tongatapu farm—some under fallow for fifteen years, others under a four-year fallow of *sa'afa* grass (*Panicum maxicum*), yet others under crops—showed a perfect gradation in the "organic" group of nutrients. An increase in bulk density and phosphorus retention and a decrease in pH and the levels of organic matter and nitrogen ran from the lightly wooded fifteen-year-old fallow through the grassy four-year-old fallow to the cropped area. Some areas were known locally as "desert" and were characterized by dying coconut trees and generally unhealthy-looking crops. Local cultivators described the land as no good for anything but a little cassava, and blamed previous continual cropping and overfrequent ploughing (two or three times a year) for its condition. Their perceptions were supported by soil samples revealing very low exchangeable potassium in an area where potassium status is usually good (Potter 1986, 14–6).

Vava'u presents a slightly different case because of leaching by the heavy northern rains falling on its steep slopes. Soil samples from Vava'u in 1962 were inherently less fertile than those of Tongatapu and contained lower proportions of all the major nutrients except potassium (Maude 1965, 15). Since the potassium levels found by Maude seem higher than those found in Vava'u now (Potter 1986), their decline is also likely to be related to changes in management practices. Vava'u farmers have increasingly adopted ploughing as a technique for land preparation. Most now grow vanilla and some other commercial crops, such as pineapples and melons, in addition to the traditional crops.

Vanilla could, however, enhance fertility and help control erosion through the planting of *fiki* (physic nut, *Jatropha curcas*) trees for the support of the vines (Potter 1986, 21). Without a guaranteed lease of at least fifteen years, however, most cultivators will not even consider planting long-term crops such as vanilla and coffee, or use fertilizers, or make other capital improvements to land. At present, most growers still cannot get secure tenure on land belonging to others for longer than three to five years (Ritterbush 1986, 97). As a result, most do not use fertilizer, except occasionally on melons or vegetables.

Some farmers stated ten years ago that the land was no longer good for growing yams, or even *kape*, which had been particularly abundant on Vava'u (Maude 1965, 19). However, as in Ha'apai, there is no apparent change in chemical properties of soils because of the length of fallow or cropping period. The greatest deterioration of soils appears to have occurred in the more intensely cultivated parts of Tongatapu. Firm conclusions regarding fertility decline are still out of reach, but there are indications of deterioration in soil nutrients and in the physical condition of soil, particularly in its water-holding capacity, where the cycle of repeated ploughing and cropping with only brief or partial fallows damages and compacts soil structures (Potter 1986, 20).

The pattern Maude observed more than a quarter-century ago still tends to obtain in most of Tonga. Fertilizers were used then for some cash crops, but were not usually applied to subsistence crops; nor had other techniques such as planned fallows, composting, manuring, or crop rotations been adopted (Maude 1970, 62). In general, very few people now outside areas of relatively intense production on Tongatapu spend much on seeds, agricultural chemicals, labor, or machine hire (Delforce 1988, 30). The emphasis on monoculture production in Tongatapu since 1988 has rather changed this picture because there has been an increased use of biocides. The public has at best only limited awareness of the dangers inherent in both the application of agricultural chemicals and in the consumption of food containing toxin residues (Tonga 1991, 27).

Broad explanations have been offered for the lack of general innovation in restoring soil fertility. First, the soils, when not subject to intensive leaching, are of high inherent fertility and can support a wide variety of crops suited to the climatic conditions. Second, high yields have been maintained despite some decline in fertility from the introduction of new crops, particularly cassava. A further reason may be the fragmentation of

landholding, which has prevented the large-scale aggregation of land. Had it been possible many years ago for much larger areas of land to be cleared and cropped by intensive agronomic methods, the land might be in poorer condition today than it is.

THE MOST RECENT DEVELOPMENTS

Tonga's system of small individually held garden plots has helped to foster a marked individualism and a desire on the part of Tongan growers to enter agricultural entrepreneurial activity. This is seen particularly in the number of growers currently trying by whatever means at their disposal to participate in squash production, which is short-term and can be highly profitable. On the other hand, by tying up most of the arable land into hereditary entitlements, the tenure system tends to prevent growers from acquiring secure tenure over land, which may discourage responsible attitudes on their part toward more sustainable commercial development.

The land tenure system and the attitudes and informal arrangements that it spawns lie at the heart of the problems currently associated with the development of commercial agriculture in Tonga. The pressures on land available for cash crops must lead to greater environmental deterioration as mangroves are "reclaimed"; fallow periods are reduced; land is cleared, ploughed, and harrowed; and continuous cropping of the soil is attempted. Changes in horticultural practices threaten the quality and structure of Tonga's naturally rich soils and are denuding the landscape of trees. A lone voice recently announced, "We need to rethink our whole approach to farming to limit the use of pesticides and fertilizer at levels that can sustain yields as well as being environmentally safe" (Pone 1992, 33).

Not only thinking is needed, but also the power to influence farm management decisions. Selective "blindness" regarding the environmental effects of current practices on the part of growers and government may derive from their complacency or from an imperfect understanding of the workings of the traditional agroforestry system. However, it is much more likely to come from the large amounts of money that can be earned by agricultural entrepreneurs. The present squash bonanza could earn the Tongatapu growers more than T\$15 million next year. The growth of the squash industry in Tonga over the last five years illustrates many current ills of commercial farming practices: the large-scale commercial venture

gains money, but at considerable cost to both the social fabric and the environment.

The people who stand to gain most belong to a wealthy business elite, made up of a few commoners and nobles, who have the influence, contacts, and capital for profitable investment in expansionist commercial agricultural production. Directors and most members of the controlling boards of the major squash export companies are drawn from this social category and are able to get the best deals, profits, and quotas. Recently, the director of one export company, who is the king's nephew, was sued by the company's growers for allegedly misappropriating the proceeds of the season's sales instead of equitably redistributing the profits. In spite of this, his company continues to get an export license and large quotas to supply squash while other applications, including one from Tonga's largest producers' cooperative company, are rejected.

Dissatisfaction has been expressed by small growers over their treatment with regard to agricultural inspections and crating and freighting arrangements. Leaders have been accused of abusing their positions as middlemen, and of taking advantage of the manipulation of contracts and readjustment of quotas in Japan, because they are the ones who travel there to negotiate with the buyers. Losses of sales arising from poor quality control, which were as much as 30 percent in the case of the company whose director is a member of the royal family, are too often passed on to the small grower. Such losses could have been shared by all the growers under contract to the export company, many of whom are better placed financially to bear a proportional reduction in profit. Some smaller growers who have taken out loans from the development bank in order to hire tractors and ploughs and buy seed and chemical sprays have reported an overall financial loss from their harvest.

People have rushed to use the land on Tongatapu, which is flat and easy of access, in order to grow squash. Some have leased land at high prices in anticipation of a high financial return; others have arranged informally with relatives or strangers to use land for a year or so. Some of these arrangements remain amiable, but too often they sour. The owners wish to lend land to more than one person, or to withdraw from one loan agreement to lend to another person. Or they renege on agreements at harvest time or when they can best escalate payments—in cash, food, or services—for “lending” their land (Ritterbush 1988, 158). Growers have been unable to find workers, or are unable to afford the inflated prices

that laborers ask at peak times, so that wives and children have become primary sources of labor for weeding, spraying, picking, washing, and packing the squash (see note 6).

Squash growers have frequently concentrated on the cultivation of their cash crop at the expense of food crops. They have either had to buy food at the market or rely on subsistence-producing relatives for sustenance, often on the understanding that the food suppliers would be given some financial recompense when returns came in from the squash. As a result of prolonged drought in Tongatapu during 1991–1992, however, many root crops failed. Those offered for sale fetched high prices at Talamahu Market. Consequently, some of the squash growers paid more than they anticipated for food, albeit to their relatives, which has caused bitterness within some families. The full implications of the complicated intrafamilial and interpersonal arrangements entered into, the lively charges and countercharges of bad management, chicanery, and greed between relatives, growers, and companies have yet to be fully played out in the social arena.

People talk of their fortune in the squash market with varying degrees of ire or rectitude, depending on their relative power and influence in the society. The land under cultivation has no voice, but may be losing in ways not yet fully known. Clearing land for squash cultivation removes every tree and native plant. Harrowing disturbs the soil further. In the absence of trees or other vegetation, topsoil flies away as dust in dry conditions or washes away with heavy rainfall. Evidence also exists of illegal encroachment by squash growers onto noble estates in 'Eua. Since the land is only marginal, its cultivation involves a greater likelihood of land degradation and soil erosion through the removal of trees and undergrowth.

Squash requires at most a period of three to four months from the preparation of the land to the harvest, so that short-term, informal arrangements may be entered into simultaneously by several growers over the same heavily chemically treated plots. Pesticides and fertilizers prepare the ground before planting and are applied every week while the plants are growing. Herbicides are used extensively to inhibit weeds. A virus carried by aphids began to afflict the crop toward the end of 1991. More chemicals were applied to control the disease, which could jeopardize "what has become the most important component of the Tonga economy" (Sturton 1992, 11). Now traces of pesticides are appearing in Tongatapu's water lens, another issue of potential significance.

Monitoring these processes is undoubtedly the key to the development of sustainable commercial production of squash, vanilla, watermelon, and other exportable agricultural produce. Monitoring systems are currently being developed by the Advisory and Research Divisions of the Ministry of Agriculture. Most likely the findings will be interpreted less in the interests of the land than in the interests of those who exert the most control over it, the people who want the biggest slices of the big new pumpkin pie. In the nature of "environmental problems" the world over, the most harmful practices are not likely to be recognized or remedial measures taken until it is much too late, and not before the Tongan landscape has been subjected to treatment as harsh as that meted out to the environment in the more developed countries of the region.

Notes

1 This is a revised version of a paper I presented on "the cash imperative" at the Seventeenth Pacific Science Congress, Honolulu, Hawai'i, 29 May–2 June 1991.

2 Until 1991, the pa'anga was roughly the same value as the Australian dollar since, during the 1980s, Tonga's imports came mostly from Australia and New Zealand. In February 1991, Tonga pegged the pa'anga to a basket of currencies, which included the US dollar as well as the Australian and the New Zealand dollars, in order to reduce the impact of erratic Australian and New Zealand currency fluctuations on the domestic price level (Sturton 1992, 21–22). By 1992, the pa'anga was equal to US\$0.75, and worth more than the Australian dollar (T\$ = A\$1.03).

3 The estimate of the total acreage of Tongan land disallows lakes and internal waters and Telekitonga and Telekitokelau islands, which make up approximately a further 20,000 acres, or 8094 hectares, to bring the total area to 184,674 acres, or 74,737 hectares (Dutta Roy 1982, 6).

4 A project financed by Japan has been proposed to drain the swampy areas of Nuku'alofa by means of dredging and building canals.

5 The species of lantana is *Lantana camara*, and of guava is *Psidium guajava*. *Fau* is the Tongan name for beach hibiscus (*Hibiscus tiliaceus*), and *tavahi* the name given to the species *Rhus taitensis*.

6 One might expect that a major consequence for most Tongans still dependent on a cash-subsistence livelihood is that if they could not work land for themselves they might become drawn into wage labor for large commercial producers. But considerable resistance to the idea is apparent, perhaps because of the jeal-

ousy of previously independent people who see a growing divergence between their own opportunities and the activities of wealthier growers, or because of a disdain for manual labor on the part of younger educated men. Some scarcity of labor is certainly a result of the emigration overseas of large numbers of young adult males. The price of agricultural labor is, therefore, an important related issue because laborers are now able to command in Tongatapu between T\$2.50 and T\$3.00 an hour plus food, cigarettes, and transportation to and from the fields, together with other perks and financial enticements, which make agricultural labor costs of T\$20–25 a day extremely high in comparison with most other Pacific Island countries.

7 Trees that are less common than they used to be include the Pacific lychee (*Pometia pinnata*), called *tava* in Tongan; oranges or Tongan *moli* (*Citrus* sp.); red cedar or *koka* (*Bischofia javanica*); breadfruit or *mei* (*Artocarpus altilis*); mango (*Mangifera indica*); lantana or *talatala* (*Lantana camara*); beach hibiscus or *fau* (*Hibiscus tileaceus*); *tavahi* (*Rhus taitensis*); guava or *kuava* (*Psidium guajava*); and leucaena or *sialemohemohe* (*Leucaena leucocephala*).

8 The most favored fuelwoods are *toa* (casuarina, ironwood, *Casuarina equisetifolia*), *tavahi* (*Rhus taitensis*), *ngatata* (*Elattostachys falcata*), *fo'ui* (*Grewia crenata*), *toi* (*Alphitonia zizyphoides*), *fekika vao* (*Syzygium clusiaefolium*), and *moli Tonga* (pomelo, *Citrus maxima*).

9 These include *koka* (red cedar, *Bischofia javanica*), *ifi* (Tahitian chestnut, *Inocarpus edulis*), *moli* (*Citrus* spp.), *tava* (Pacific lychee, *Pometia pinnata*), and, to a lesser extent, *loupata* (*Macaranga harveyana*) and mango (*Mangifera indica*).

10 These are predominantly *sialemohemohe* (leucaena, *Leucaena leucocephala*), *kuava* (guava, *Psidium guajava*) and *fau* (beach hibiscus, *Hibiscus tiliaceus*).

11 Poorer fuelwoods include *ngatae* (coral tree, *Erythrina variegata* var. *orientalis*), *vavae* (kapok, *Ceiba pentandra*), and *tiulipe* (*Spathodea campanulata*). Shrubby weedy species include *'akauveli* (*Indigofera suffruticosa*), and *talatala* (lantana, *Lantana camara*), and hedge plants include *tanetane* or panax (*Nothopanax* spp.), *kaute* or hibiscus (*Hibiscus rosasinensis*), *fiki* or physic nut (*Jatropha curcas*), and *fue kula* or bush morning glory (*Ipomoea angulata*) (Thaman 1989).

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Abstract

The increasing commercialization of agriculture in Tonga has led to the adoption of agricultural practices that favor short-term monetary gain over the traditional techniques associated with more sustainable forms of agroforestry. Newer forms of cultivation and the overuse of the relatively small amounts of land available for commercial development will almost certainly lead to greater environmental deterioration than is now evident. The shortage of available land arises largely from the tenure system instituted last century, which distributes land by hereditary entitlement. Until recently this system has been considered the most equitable in the Pacific Islands, but it is now encouraging misuse of land. Because of population growth, proportionally fewer eligible men can now acquire garden land. At the same time, noble estate-holders still control large tracts of land, and thou-

sands of customary allotments that have been allocated formally to individuals are underused because the registered landholder has moved away, often overseas. The land that is available for reallocation tends, therefore, to fetch high rents for only short lease periods. As a result, wealthy businessmen and nobles who control land have become the more successful agricultural entrepreneurs. Smaller operators obtain land through informal, often insecure, arrangements. Commercial growers often try to increase cash returns on crop yields by shortening fallow periods, thereby reducing the quality of both soil nutrients and revegetation. Trees are felled to facilitate mechanical tillage, a practice that disturbs soil structures. The increasing use of biocides, particularly on recently introduced monocultures, will further affect the environment in ways that are not yet adequately understood.