

Indigenous Agroforestry in American Samoa¹

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Abstract: Agroforestry exists in American Samoa as a system where indigenous trees and natural vegetation used for food, fuelwood, crafts and medicine are incorporated with traditional staple crops and livestock on a set piece of land, usually a mountainous slope. Most agroforests are taro-based (*Colocasia esculenta*). While nutritional, cultural, social, economic and ecological benefits are realized from the agroforest, sufficient quantitative and qualitative documentation and widespread knowledge of the importance of agroforestry is lacking. Other problems include a shift toward monocropping, the land tenure system, illegal watershed intrusion, and the threat of pesticide misuse. To promote this highly sustainable and culturally important system, a holistic approach including detailed documentation, setting up of demonstration plots, and an active education program are suggested.

American Samoa, an unincorporated territory of the United States, is composed of five volcanic islands in the South Pacific—Tutuila, Tau, Ofu, Olosega and Aunuu; and two coral atolls: Rose and Swain's Island. Total land area is 19,200 ha. American Samoa is about 3,680 km southwest of Hawaii and 6,640 mi southwest of San Francisco. The population of American Samoa as of April 1991 was 46,638. The five volcanic islands are characterized by rugged mountainsides, small valleys and a narrow coastal fringe. The highest elevation is 926 m on Tau Island. Lush vegetation grows throughout the islands because of high rainfall, the tropical climate, and fertile soil. The economy is heavily dependent on two tuna canneries and the Government of American Samoa, who together employ more than half the labor force.

American Samoa enjoys a tropical climate with an average rainfall between 5000 to 6350 cm per year. The driest period is between June and September and the average annual temperature is 27°C. Hurricanes occasionally hit the island with the most recent, Hurricane Ofa, striking in February 1990.

The agricultural system is based mainly on subsistence farming. Crops are produced for the immediate needs of the family or for use as gifts. Most families grow at least some of their staple foods which include taro, bananas, breadfruit, yams, and coconuts. Other crops commonly grown are cassava, giant taro, papaya, pineapple, and citrus. In most places the crops are interplanted. A few small commercial farms specialize in cucumbers, cabbage, green pepper, onion, tomato, and eggplant. These farms supply the local markets and the fishing fleet that supports the canneries. In recent years, the economy of American Samoa has become more cash-dependent. Consequently, some crops are sold at the local market.

Land in American Samoa is owned jointly by family members. The matai or chief assigns land to be worked by family members in the village. Implements of traditional agriculture include hand tools, such as the oso, a long, pointed digging stick

used in the planting of taro. Hand weeding or slashing of weeds with a machete is a common week end task for the family. Fertilizers and pesticides are used in small amounts, mainly due to the unreliable supply of these items on island. Backpack sprayers are used for pesticide application. Rototillers and small tractors are sometimes used for plowing. Some American Samoans have brought in relatives from Western Samoa or hired Tongan or Oriental farmers to work their land full time, while they pursue wage jobs.

Traditional Agroforestry

Agroforestry has existed in American Samoa for centuries. It is a system where indigenous trees and natural vegetation are incorporated with traditional crops, vegetables, and sometimes livestock on a piece of land to serve as a basis for meeting the needs of the family and community. The importance of agroforestry to the Samoan people can be categorized in the following ways:

Nutritional Importance

Indigenous agroforestry provides the basic staples of the Samoan diet. Traditional agroforestry food crops include taro, giant taro ("ta'amu"), coconut, banana, breadfruit, yam, papaya, mango, oranges/citrus, and other assorted fruits and vegetables. Livestock such as pigs and chickens are also incorporated into the agroforest setting. The traditional diet is considered more nutritious than imported foods, which are often high in fat and sugar content. Taro, banana, breadfruit, and yam are excellent carbohydrate sources. Livestock and fish provide protein. Fruits such as mango, guava, papaya, soursop, avocado, coconut, and breadfruit are very good sources of fiber, vitamins C, A, and B-complex and micronutrients.

Cultural/Social Importance

Plants of the Samoan agroforest are critical cultural resources. Certain plants are used medicinally by traditional healers while the agroforest and surrounding rainforest are potential pharmacological reservoirs. Other plants supply the raw materials for special occasions (e.g., *Piper methysticum* in the "kava" ceremony) and provide for the raw materials to build, bind, and decorate traditional crafts, housing (fale), and canoes.

Agroforestry food products and farming practices are also important in a social sense. Taro, breadfruit, banana, and pigs, for example, play an important part in the Samoan tradition of "fa'alavelave" where family members are called on to support each other in times of celebration or mourning.

The planting and maintenance of a family's agroforest plots also strengthens family ties and promotes social bonding. Members of different generations work together, teach each other,

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exchange stories, sing songs, joke around, and reinforce the value systems that make Samoan culture so unique. Health benefits are also derived from the exercise involved in preparing the land, planting, weeding, and harvesting of crops, especially on the steep slopes.

Ecological Importance

The diversity of the Samoan agroforestry system promotes stability and protection against natural disasters and pest infestations. For example, taro pests are infrequent in an agroforest for several reasons. First, the physical separation of like crops in the intercropped planting scheme characteristic of agroforests interferes with the insect's detection of and spread to crops of the same species. Since insect tastes are very specific, this prevents outbreak situations from occurring. Similarly, chemical odors emitted from the various plants confuse the insect's sense of smell, which is also crucial in host detection. Finally, weeds and other non-crop components of the agroforest often act as a nectar source for biological controls, which generally are nectar-feeding wasps or flies that parasitize insect pests.

Trees of the Samoan agroforest are ecologically important in many ways. They serve as windbreaks, provide shade, recycle soil nutrients and prevent soil erosion. Trees such as the *Erythrina* and *Sesbania* are important in nitrogen fixation. The agroforest also provides the habitat and food sources for the fruit bats that pollinate up to 70 percent of the native rainforest. Similarly, it helps maintain doves, pigeons, and other birds of traditional importance.

Economic Importance

A tremendous economic advantage is realized through the growing of one's own food and the collecting of firewood from one's own land. Most Samoan households grow some portion of their staple food, usually taro, banana, and breadfruit. The cultivation of non-food trees also provides considerable economic benefit. Pandanus, for example, is important in the production of woven crafts and fine mats. These items are an important unit of exchange in Samoan culture and a source of income for the makers. Likewise, the paper mulberry (*Broussonetia papyrifera*) is important in the production of tapa cloth, which is a highly valued Samoan art form. Other plants and trees are sources of dyes for making tapa. Samoan agroforest trees also serve as sources of carving, building, and fence-making materials.

Components of Agroforestry Systems

Most agroforestry systems in American Samoa include taro. An initial documentation of these taro-based systems was made in November 1989 by an interdisciplinary team as part of a Low-Input. Sustainable Agriculture (LISA) project. The survey tool used was a Rapid Rural Appraisal (RRA). Table 1 lists the various components of these taro-based systems and the percentage of farmers planting that crop in association with taro. Over 50 percent of farmers surveyed grew taro with the following: banana (86 percent), coconut (73 percent), gi-

ant taro (*Alocasia macrorrhiza*) (68 percent), papaya (64 percent), *Erythrina variegata* ("gatie") (59 percent), and yam (50 percent) in a multicropped system with taro. Twenty-one varieties of *Colocasia esculenta* were documented with over 50 percent of the farmers growing Niue, Manua, and Pa'epa'e varieties. This survey provides a starting point for agroforest documentation that can be supplemented with additional details of other representative systems.

An initial categorization of agroforestry systems in American Samoa is suggested below:

Village/Small Plantation Systems

- taro (*Colocasia esculenta*)
- ta'amu (*Alocasia macrorrhiza*)
- banana (*Musa* spp.)
- papaya
- coconut
- livestock (pigs, chickens)

Upland Systems

- coconut
- breadfruit (*Artocarpus altilis*) -ta'amu
- taro
- taro palagi (*Xanthosoma sagittifolium*)
- cocoa (*Theobroma cacao*)
- pineapple
- fuelwood trees ("toi" -*Alphotonia zizyphoides*, "lopa" -*Adenanthera pavovnina*)
- livestock (pigs)

Village/Large Plantation Systems

- taro
- banana
- ta'amu
- yams (*Dioscorea alata*)
- cassava (*Manihot esculenta*)
- pineapple
- fruit trees: mango, *Citrus* spp.; Avocado (*Persea americana*)

Table 1-Crops grown with *Colocasia taro* (1989 RRA LISA Taro Survey)

Crops grown with taro	Percent of farmers
Banana	86
Coconut	73
Ta'amu (<i>Alocasia macrorrhiza</i>)	68
Papaya	64
Gatie (<i>Erythrina variegata</i>)	59
Yam	50
Breadfruit	45
Cassava	36
Ti	36
Vegetables	32
Plantain	27
Sugarcane	23
Citrus	18
Cocoa	18
Pineapple	18
Pele (<i>Hibiscus manihot</i>)	14
Kava (<i>Piper methysticum</i>)	14

- flower trees: *Hibiscus* spp., *Plumeria* sp.
- vegetables: pele (*Hibiscus manihot*), green pepper (*Cap-sicum frutescens*), tomato, and *Brassica* spp.
- livestock (pigs, chickens)

Threats to Agroforestry

American Samoan society is constantly being exposed to ideas of Westernization, modernization, and mechanization. As a result, traditional practices are continually being challenged or modified. Likewise, the practice of agroforestry also may be threatened in several ways:

Importance of Agroforestry Not Realized

Agroforestry, as is anything that is commonplace, is often taken for granted and not openly valued or esteemed. Without adequate documentation, discussion and reaffirmation of their merits, many agroforestry practices may disappear. The lack of qualitative and quantitative data on the nature, extent, cultural and ecological value of agroforestry is a major problem.

Promotion of Monocropping

Some farmers have shifted to monocropping of taro and other crops, expecting high yields and profit from an intensely planted crop. While profits might increase initially, there are inherent disadvantages in the practice that may eventually cause a decline in profits. Pest outbreaks are more common in monocropped fields because of the ease of pest dispersal from plant to plant. Soil nutrients are depleted more rapidly under monocropped conditions. Additionally, soil erosion is more likely to occur in monocropped fields where a tractor has been used for plowing.

Land Tenure System

Under the "Matai" system, land disputes are common. What one "matai" has sold or assigned may not be honored by their successor. Often, boundaries of family land are not definite. As a result, proper use and maintenance of a given area of land is threatened.

Firewood Gathering Practices

Firewood is taken from the watershed indiscriminately or illegally at times. Besides causing land disputes, this practice may predispose the land toward landslides, soil runoff, and other soil erosion problems. Most plantations are located on slopes of 30 degrees or more.

Pesticides

Pesticide use is minimal on the island, according to the recent RRA survey (table 2). However, there is the threat of the misuse of pesticides near water runoff areas. This would serve as a possible source of pollution for groundwater, water catchment systems and the reef. These components of the agroforestry system need to be protected to insure the sustainability of the entire agroforestry system.

Future of Agroforestry in American Samoa

The continuation and possible expansion of agroforestry in American Samoa shows great potential. The approach to this should be holistic. Efforts must be made to base planning decisions regarding agroforestry on more than economic and political factors. Other criteria such as nutritional, medical, cultural, social, aesthetic, spiritual and ecological factors must be given greater consideration. The following suggestions are being made to address these considerations so that the future existence and improvement of agroforestry in American Samoa may be insured.

Documentation of Current Systems

Collecting of quantitative and qualitative data on the existing agroforestry systems and associated practices must be made in order to serve as a record of traditional knowledge and values. With this information, aspects of the system can be scrutinized and supplemented with appropriate technological advancements. This documentation will also provide baseline data on which to base future comparisons.

Introduction of Desirable Species

Traditional systems can be modified by introducing new plant species that will enhance or vary the food-producing capabilities of the system, increase income for the family, or promote nutrient-recycling capabilities.

Table 2-Use of agrochemicals in American Samoa (1989 RRA Survey of 28 farmers)

Name of agrochemical	Type	Farmers (pct.)
Paraquat	Herbicide	50
Malathion	Insecticide	27
Round-up	Herbicide	14
Ambush	Insecticide	5
Benlate	Fungicide	5
Dicidex	Insecticide	5
Commercial Fertilizer	Fertilizer	5

Establishment of “On” and “Off” Station Demonstration Sites

In order to promote the idea of agroforestry in American Samoa, demonstration sites are needed to illustrate to the public the workability and sustainability of the system. Variations of the current systems also can be presented so that educated comparisons can be made.

Educational Program

An active environmental education program must be initiated to inform policy makers, government planners, extension agents, children, and the public about agroforestry. Through education, aforementioned problems of land tenure, monocropping, firewood gathering practices, and pesticide misuse can be addressed. Education of the youth through 4-H or other organized groups would be of beneficial, long-lasting investment. Special workshops for Extension workers would help agents in explaining and furthering the concept of agroforestry to their clients as well as prepare them for questions. Advantages and disadvantages of the system must be openly discussed.

To supplement documentation and provide a further basis for educational programs, research and experimental confirmation of various attributes of the agroforestry system is needed. Cooperative research with the staff of the local Land Grant college would assist in this regard.

Conclusions

The future of agroforestry appears bright in American Samoa because recognition of the problems associated with its possible disappearance have already been recognized. However, as the above approaches suggest, active promotion of the system to government planners and the public must be made in order to insure the maintenance of this highly sustainable and culturally important system.

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