

Traditional knowledge is the key to sustainable development in Samoa: examples of ecological, botanical and taxonomical knowledge

Namulauulu G.V. Tavana *

Introduction

Samoa, like many small island nations provides special challenges for economic development and environmental management. Samoa's isolation, small size, aboriginal settlement and later contact with European-based colonialism, fragile ecosystem based on a highly endemic flora and depauperate fauna, and contingency on external forces of economic and political power for development create an extraordinary vulnerability. The need for sustainable development with the focus on improving the standards of living and the quality of life for all Samoan citizens of today and for future generations is greater than ever before.

Sustainable development

The World Commission on Environment and Development Report in 1987¹ described sustainable development as: "development that meets the needs of the present without compromising the ability of future generations to meet their own needs." Simply put, poor decisions of how a country can balance social, economic and environmental needs of today can mortgage the future for those to come. But this balancing act is a challenge for most Samoans where one has to juggle between meeting the basic household needs of the family and the demands of the extended *aiga* obligations with the long-term health of the environment.

Social, economic and environmental issues are inextricably intertwined and cannot be independently considered. For example, wasting of human capital by failure to adequately invest in education, both in western ways and in traditional *aganuu*, limits opportunities for economic growth as well as the search for cultural identity, resulting in impoverishment of both the pocketbook and the soul. Deculturated poor, who tenuously hover on the periphery of both the western economic system as well on the edge of the rich tapestry of Samoan culture, are unable to access resources in either western or indigenous infrastructures.

Such individuals, unable to obtain adequate health care from either the western medical system or the village *taulasea*, or better education, either in the western system or from village *matai*, are likely to degrade the environment as they struggle simply to survive, cutting down the rainforest for fuel, filling critical mangrove and estuarine habitats for land reclamation, dynamiting fish and destroying coral, accelerating destructive urbanization while contaminating the environment with waste products they cannot afford to dispose of, recycle or treat. The downward spiral of poverty and deculturation seems only to fuel rather than satiate the desire for imported goods which, unlike our material culture of former years, not only destroy Samoa's environment but also weaken Samoa's currency and internal economic systems.

¹Dr. Tavana is the Director of Education at the National Tropical Garden, Hawaii

Both the village subsistence economy and western economy of Samoa depend on the sustainable use of renewable resources, but their overuse and depletion for short-term gain may jeopardize potential long-term economic future. It is only when environmental, cultural, and economic impacts of decisions are considered together as it is with village *fono* dealings that the probable effect of development on the future trajectory of Samoa can be accurately evaluated. It becomes the challenge for the government and people of Samoa to develop strategies that incorporate traditional knowledge to make a more effective and sustainable use of natural resources while maintaining both their ecological and cultural functions.

In this paper, I discuss that traditional Samoan knowledge, rooted in core cultural values is key to sustainable development of natural resources. Critical audiences within Samoa, however, must recognize the rate in which such invaluable knowledge is diminishing and how it impacts all levels of the Samoan society. As way of example, traditional knowledge of land use and management, healing practices, and identification systems, which have now been externally validated by western science, can provide an appropriate model for sustainable development.

Traditional knowledge

Traditional knowledge of indigenous peoples has increasingly become the center of attention within the past decade.² It encompasses many fields including ecological, botanical and taxonomical knowledge. Worldwide, traditional knowledge is acquired through daily experimentation, and is generally passed from one generation to the next, typically by word of mouth. In Samoa, much of the way traditional knowledge functions is guided by core cultural values of respect for the elders and the *matai* system, communal collaboration, deep care for one another, consensus, and productivity for the welfare of the larger Samoan society.³ Furthermore, traditional knowledge embraces Samoans view of themselves as stewards of sacred natural resources, with a special charge by Deity to protect them as their heritage. We consider our islands as “*O le nuu o lo tatou tofi mai le Atua*” (The land of our heritage from God) and therefore believe that our relationship with the land places upon us a sacred responsibility to kin, ancestors and Deity. These cultural values held central to the individual and collective identity of the Samoan people provide their worldview and guide all facets of their way of life.

Such indigenous knowledge, carried in the vessels of culture, language, legend, myth and folklore, serves as a storehouse for local biological information. *Explicit indigenous knowledge*, that which is easily articulated to outsiders such as the names of reef fish, the breeding times of birds, or the use of medicinal plants, must be combined with *tacit indigenous knowledge*, that which we cannot easily describe to outsiders such as the deep respect Samoans have for the elderly or the process of achieving consensus within a village *fono*. Indeed, many of the core contributions that Samoan culture has to offer to the world are in the form of tacit knowledge. Throughout the world, explicit and tacit indigenous knowledge are of fundamental value in the management of natural resources, in the maintenance of the world’s biodiversity, and in construction of local models necessary for sustainable development. In fact, traditional knowledge provides the basis of modern scientific discoveries and continues to help facilitate new information. Turner et al. confirmed: “traditional knowledge has received recognition as being complementary to, equivalent with, and applicable to scientific knowledge.”⁴ But whether traditional knowledge will survive the new millennium remains a question of time.⁵

Erosion of traditional knowledge

As we enter the 21st century, this traditional knowledge system is changing – the cultures and languages of Samoa are becoming increasingly endangered. Much of it has been significantly influenced by the dual phenomena of early European colonialism and more recently, internally imposed eco-colonialism – the destruction of indigenous culture and village hierarchies in the name of environmentalism⁶ - which inevitably serve to dilute the Samoan religious, economic, cultural and political character. With the loss of traditional knowledge and respect for traditional institutions irreplaceable links with the land and biodiversity are lost as well. We look in vain for examples of western managements systems that have facilitated sustained utilization of natural resources for anything approaching the span of a single Samoan village- in the case of Falealupo, ethnohistorical accounts suggest over a thousand years of uninterrupted political continuity of the village chiefs have maintained a species-diverse lowland rain forest, which has been continuously used for canoes, kava bowls, and medicinal plants. The loss of traditional knowledge is a loss to the understanding of the local biological resources and a threat to a deeper understanding and relationship with the natural world.

Linguist Michael Krauss claimed that half of the 6000 languages spoken at the beginning of the 20th century have disappeared; of the languages remaining, 80% are spoken only by the elderly people.⁷ Deterioration of language has serious implications for the Samoan culture: when elders die, the language, cultures and knowledge die with them. Recent ethnobotanical studies in Samoa (unpublished) confirmed two distinct knowledge realms; the common knowledge and the expert knowledge of the elders that is rapidly fading⁸ and the chance for such knowledge to perpetuate in the future is questionable (Chart 1). A study on generational knowledge involving cultural practices like breadfruit fermentation in the Federated States of Micronesia showed a steep decline with time because these skills – once critical for survival in an area vulnerable to periodic cyclones — have not been successfully passed on from the elders to their younger children.⁹

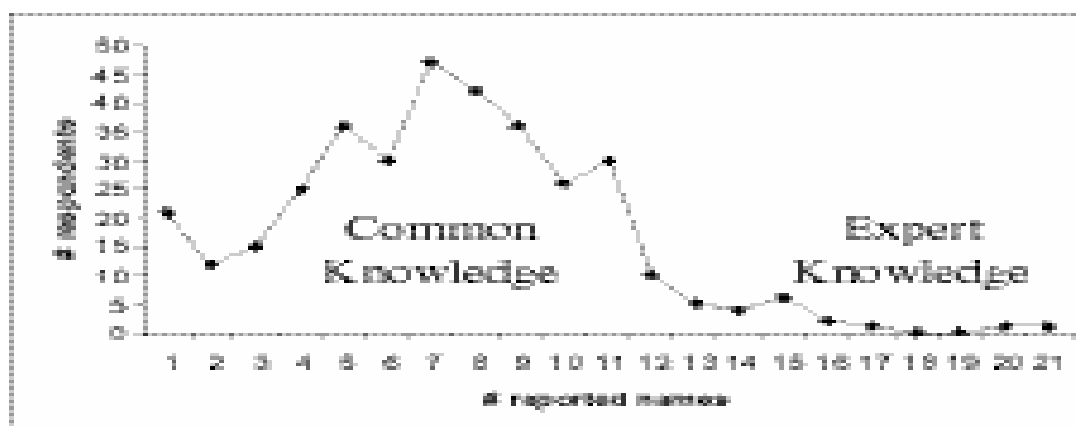


Chart 1. Samoa Ethnotaxonomy – Distinct Knowledge Realms

The loss of traditional knowledge crucial in matters of conservation and sustainable development is analogous to the loss of species and biodiversity: like the loss of lashings on an ocean-going canoe, the loss of each species and each bit of indigenous knowledge imperils our voyage to the future. Unless the real significance of these losses is soon appreciated, efforts to stop cultural extinction sweeping throughout the world are doomed. Unlike some

other indigenous peoples, such as the Penan in Malaysia, or the Kayapo in Brazil, the Samoan people are fully in control of both their land and their political future, so loss of an entire people is unlikely. But given this cultural robustness, it is possible that loss of traditional knowledge will not only reduce the carrying capacity of the entire archipelago, but will also lead to a loss of cultural identity for future Samoans. Already Samoan-Americans¹⁰ face among some of their children, recruitment into gangs, drug abuse, and social decay, which would not occur if a strong cultural identity had been passed on. Similar culturally destructive forces such as crime and suicide rates among deculturated youth in the town areas surrounding Apia, make it even more important to properly value, maintain, and apply Samoan traditional knowledge. Loss of languages and cultures equals the loss of ecological knowledge of traditional land use and management (agroforestry), botanical knowledge of healing practices (ethnomedicine), and classification and naming systems (ethnotaxonomy), containing much information crucial to conservation and sustainable living.

Agroforestry

Many pre-European resource management strategies were practiced and sustained in the Pacific Islands for hundreds of years. Traditional, subsistence agriculture has the advantage of being environment friendly but comparatively low productivity. Agroforestry is a traditional approach to land-use commonly practiced by integrating trees with other crops planted in a multi-storied fashion, which “diversifies and sustains production for increased social, economic and environmental benefits for land users at all levels.”¹¹ These mixed cropping systems create favorable conditions for the soil, water and nutrients and proven excellent for environmental conservation and sustainability.

During the German colonial period, maximum production of cash crops such as copra and cocoa was the primary goal, hence, trees were systematically removed and single monoculture cash crops were introduced. These monoculture systems quickly replaced traditional Samoan multicrop-, rotational systems in Upolu and parts of Savaii, with the land owners and plantation managers sometimes usurping the role of traditional village councils in allocating rewards and meeting out justice. Monocrop systems may generate short-term profits but are very costly long-term environmentally, economically and ecologically. Unstable markets and fluctuation in prices can be a great loss to a single species planting, and similarly, there is a high risk of devastating problems caused by a single pest or disease as experienced by Samoa with the taro leaf plight devastating the entire taro industry.

Research identified benefits of multicrop, agroforestry agricultural systems that far outweigh any possible adverse effects. They can diversify products, optimize use of space, sustain soil fertility, reduce pests and diseases, conserve soil and water, ensure high level productivity and long-term production, reduce carbon dioxide emissions, increase biodiversity, and are culturally compatible with traditional Samoan ways.¹² Convincing evidence shows that smallholder agriculture, can maintain impressive yields per unit of land without degrading the resource base of the environment. Stevens advocated “the success of smallholder cultivation is not only its large and dependable production but its ecological continuity and conservation, its sustainability in the currently popular phase.”¹³

Ethnomedicine

Samoans have lived and used plants for over 2500 years and therefore had experimented, experienced, and provided treatment using their indigenous flora. Although there is a general understanding shared by most Samoans of simple remedies for common maladies, there are individuals with specialized and extensive knowledge of traditional healing practices —

taulasea. The majority of these are women; are highly gifted and have developed the ability to diagnose diseases, identify, prepare and administer herbal remedies, and are plant experts in their own right.¹⁴ The impressive role of a *taulasea* then assumes that of a physician, pharmacist, pharmaceutical company, and botanical explorer. She would attend to her patients with absolutely great devotion, applying the knowledge she had once learned while young, and hoped to have the same knowledge transmitted to her daughter who serves as an apprentice.¹⁵

This formidable knowledge and wisdom of Samoan *taulasea* can certainly provide insight into human health. The National Prescription Audit of 1976 confirmed that 25% of all prescription drugs contain a pharmacologically active compound derived from, or originally isolated from plants, most of which are used in traditional medicine. Despite many leads from plants as identified by *taulasea*, not every compound present is useful or result in therapeutic drugs. Scientists can help discover new drugs through the employment of ethnobotanical approaches and working with *taulasea*.

A survey of the Samoan ethnopharmacopoeia including some 104 plants extracts consisting of 74 different plant species showed a very high correlation between the Samoan traditional knowledge of medicinal plants and the presence of pharmacological activity. Over 86% of the plants tested showed some pharmacological activity sufficient to warrant further analysis. Chemical characterization of the pharmacologically active extracts is conducted through fractionation procedures in combination with bioassays to separate specific active ingredients from other chemicals in plants (Table 1).¹⁶

Family	Species	Plant part	Hippocratic Screen		Guinea Ileum	
Agavaceae	<i>Cordyline fruticosa</i>	Leaves	(+)	(+)	++	+++
Convulvulaceae	<i>Ipomoea pescaprae</i>	Leaves	(+)	+	0	++
Fabaceae	<i>Erythrina variegata</i>	Stem wood	0 (+)	+ (+)	+ +	+c +++c
	<i>Vigna marina</i>	Leaves	0	0	+	++
Moraceae	<i>Artocarpus altilis</i>	Roots	0	(+)	0	0
Piperaceae	<i>Piper methysticum</i>	Roots	(+)	0	++	+++
Poaceae	<i>Cymbopogon citratus</i>	Stem	0	+	0	++
Rubiaceae	<i>Morinda citrifolia</i>	Fruits	0	+	0	0
		leaves	(+)	0	0	+

Table 1. Sample plants surveyed for pharmacological activity (Cox, 1989).

Many new drugs have been discovered through ethnobotanical approaches from the past centuries. About 300 years ago, Linnaeus, the father of ethnobotany, interviewed a *Sami* indigenous healer at Jokmökk, Sweden. Scientist Sean Connery accidentally learns of a cure for cancer while speaking with a *shaman* a native healer in the Amazon. Ethnobotanist Paul Cox's interview with Epenesa Mauigoa resulted in an extensive account that described 121 different herbal remedies from 90 different species of flowering plants and ferns. Similar interviews led to the discovery of the *mamala* plant *Homalanthus nutans* and isolation of the antiviral drug prostratin, effective against the human immunodeficiency virus type 1.

In August 2001, the Aids Research Alliance signed an agreement with the Samoan government that will return to Samoa 20% of all ARA profits on prostratin, even if the drug is entirely synthetically derived. But the ARA also pledged in the agreement to encourage pharmaceutical firms to produce, if economically feasible, prostratin from Samoan plantations of *Homalanthus nutans*, and will credit Samoa with any diplomatic effort to provide prostratin at little or no cost to impoverished countries in Africa. The break-down of the percentages in the ARA-Samoan government is even more revealing: 12.5% of all profits will be returned to the Government of Samoa, 6.7% to the village of Falealupo where the plant was first collected, and 0.4% to each of the two families whose grandmothers instructed Cox in the use of the mamala plant in the treatment of viral disease. This agreement, if prostratin successfully completes clinical trials and is released on the market, could result in millions of dollars being returned annually to Samoa, even if a single kilogram of the plant is never exported.

Ethnotaxonomy

The naming and classification of plants was made necessary because man depended on them since the earliest stages of civilization. As the numbers of known plants increased, it became necessary to group them into broader categories according to some systematic criteria such as using common characteristics. These efforts however led to great confusion because not only unrelated organisms with superficial resemblances were grouped together, but consistency in naming systems was also lacking. In response to the cumbersome 18th century naming systems and classifications, Carl Linnaeus invented what was first published in the *Flora Lapponica* and later expanded in the *Species Plantarum* in 1753, which was then used to organize the Uppsala Garden in Sweden. Known as the binomial nomenclature, this Western taxonomy comprising the *genus* and the *species*, is now being used throughout the world.

Indigenous societies extensive use of plants to sustain life enabled them to create their own traditional naming and classification systems — *ethnotaxonomy*. In the summer of 2000, professors and Tropical Ethnobotany graduate students from the National Tropical Botanical Garden in Hawaii studied the naming systems of plants for the first time, and compiled a comprehensive list of breadfruit varieties and names. Using the morphological criteria, about 350 Samoans were interviewed to distinguish breadfruit varieties. Results show that the Samoan ethnotaxonomy also use both binomial and monomial nomenclature similar to that used in Western taxonomy. In the example *'ulu maa*, "ulu" is the generic term and "maa" is the specific modifier, and in the example *maopo*, the generic term is understood and the specific modifier is unambiguous. Samoan traditional knowledge explains that monomials are used only if the names are unambiguous and binomials are used to reduce ambiguity (Table 2). Specific modifiers provide descriptions to distinguish breadfruit varieties.

Names	Rank	%	Type	Description
maafala	1	90	UM	
puou	2	81	UM	
aveloloa	3	68	UM	
maopo	4	62	UM	
'ulu ea	5	56	AB	'Uvea Island
'ulu ma'a	6	55	AB	solid
'ulu Manu'a	7	37	AB	Manu'a Islands
momolega	8	33	UM	yellow
'ulu sina	9	22	AB	white
sagosago	10	17	UM	

Table 2. Breadfruit varieties - naming and saliency

Conclusions and recommendations

Traditional knowledge is vital to sustainable development of Samoa's natural resources. This knowledge incorporates Samoan culture and language, myths and legends presenting a worldview that contain potent biological information. Using traditional knowledge as the basis, scientific research and information garnered from ethnobotanical approaches can be integrated to provide a model for sustainable development strategies appropriate for Samoa. Unfortunately, this traditional knowledge is imperiled and not much is known about the nature of the interaction between the two. I offer the following recommendations:

Central and local village governments, environmental community advocates and universities could become proponents of valuing, preserving and protecting Samoa's invaluable traditional knowledge before it disappears forever. Tropical ethnobotany courses that encompass laboratory and field instruction in history, interviewing techniques, plant collection, and vouchering herbarium specimens should be offered at the university level. Scientists who have genuinely contributed extensively to Samoa can provide professional consultancy to bridge scientific information and traditional knowledge crucial in sustainable development and conservation. To fully understand and appreciate sustainable development and the impact on our lives, all scientific research papers published must be translated into Samoan. Traditional knowledge should be included at all levels of the school curricula using creative approaches to involve village elders and local experts. Traditional expertise and the voice of the local village communities should be sought during deliberations on the development of policies regarding sustainable development.

Sustainable development and conservation of Samoa's natural resources could be significantly advanced if modern scientific knowledge could be incorporated into traditional knowledge systems. Standards of living and the quality of people's lives of today and the future will greatly improve as they fully understand and become better equipped on how to meet their social, economic and environmental needs.

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