



AgEcon SEARCH

RESEARCH IN AGRICULTURAL & APPLIED ECONOMICS

The World's Largest Open Access Agricultural & Applied Economics Digital Library

This document is discoverable and free to researchers across the globe due to the work of AgEcon Search.

Help ensure our sustainability.

Give to AgEcon Search

AgEcon Search

<http://ageconsearch.umn.edu>

aesearch@umn.edu

*Papers downloaded from **AgEcon Search** may be used for non-commercial purposes and personal study only. No other use, including posting to another Internet site, is permitted without permission from the copyright owner (not AgEcon Search), or as allowed under the provisions of Fair Use, U.S. Copyright Act, Title 17 U.S.C.*

No endorsement of AgEcon Search or its fundraising activities by the author(s) of the following work or their employer(s) is intended or implied.

Use Values of Forests in Pohnpei

**Frank Scrimgeour,
Jane Gallen**

**Contributed Paper presented to the 47th Annual Conference
Of the Australian Agricultural and Resource Economics Society**

At

Fremantle,

February 12-14, 2003

USE VALUES OF FORESTS IN POHNPEI

Frank Scrimgeour and Jane Gallen
Department of Economics
University of Waikato¹

Introduction

Forests have significant use value to the people of Pohnpei. However current management practices are unsustainable. This paper presents research examining the use of forests in Pohnpei and the significance of use values for sustainable management.

Pohnpei is the third largest island in the Federated States of Micronesia, with a land mass of 129 square miles (335 square kilometres) including coral and volcanic reef islets, averaging 13 miles in diameter. Pohnpei is roughly circular with numerous coves and peninsulas protruding along the coastline. The island is surrounded by mangrove forest and a large lagoon with a total surface area of approximately 70 square miles (179 square kilometres). The lagoon is enclosed by an outer barrier reef, which is located generally about 2 miles (3.2 kilometers) from shore. The interior is mountainous and Nahna Laud (Big Mountain) and Ngihn Eni (Ghost Tooth) are the highest elevations being over 2500 feet (760 meters) above sea level (Merlin et al. 1992).

Pohnpei's vegetation and wildlife are some of the most diverse in Micronesia. The upland forests serve as habitat for at least 269 different species of plants, of which 110 are endemic to Pohnpei. The upland forest also provides a home for the island's wildlife, and the people of Pohnpei depend on many birds and animals for subsistence or income. There are over 24 different species of birds, which nest in the upland forest, of which five species and eight subspecies are found only in Pohnpei (Raynor, 1996).

According to the 1994 census, the population of Pohnpei state is 33,000, which includes the outer islands of Pohnpei state. About 90% are ethnic Pohnpeians, while the rest are predominantly from the other FSM states, Palau, the Marshall Islands, the United States of America, Australia and Japan. The rapid human population growth along with high dependence on agriculture both place pressure on upland forest environment. This has resulted in much of the native upland forest being converted into traditional agricultural planting areas. This environmental issue is not unique to Pohnpei. Many other Pacific islands experience the same problem, where farmers depend on the native forests for survival. Many of these areas are converted to cultivate taro, breadfruit and coconut plantations. On Pohnpei, kava plantation is perceived to be the dominant activity causing deforestation, where the farmers' main intention is to earn fast cash to support family needs.

Kava (*Piper methysticum*) is a drink with narcotic effect, which is derived from well-pounded roots. Kava has been a significant plant in the culture of the people of

¹ Corresponding author: Frank Scrimgeour. scrim@waikato.ac.nz

Pohnpei. The plant is sacred to many and is the central feature of the social and cultural functions of the people. Kava is used in several ways. It is used during ceremonial feasts (*kamadipw en wahu*) for the paramount chiefs to celebrate the start of yam season. It is used during *nohpwei*, the ceremony of first offerings of breadfruit and yam to the gods and chiefs. Due to kava's respect value, it is presented on visits to the chiefs at anytime. It is also used to settle disputes when someone asks for forgiveness, for marriage ceremonies, and for other occasions when a commoner needs to meet with the higher traditional ranked people or the chiefs (Ashby, 1990; Anson and Raynor, 1993). Kava continues to have a central feature in Pohnpei's cultural and social functions despite being commercialised.

Research Method

The primary goal of this research was to make a preliminary estimate of the use value of Pohnpei's upland forests. To this end a survey was conducted. The survey design was based on three main objectives: First, to obtain values of the forest products, which the rural community members depend upon; Second, to gain information on the history and community members' use of the upland forests; Lastly, to gain general information on the socio-economic characteristics of households. Gallen (2002) provides further information on the research method.

The survey questionnaire consisted of open-ended, partially open-ended and close-ended questions. Open-ended questions allow free or unstructured responses. Partially open-ended questions offer a set of fixed selections with a final open choice or option of "other". Close-ended questions lead to a set of fixed choices. Open-ended questions have several advantages. They do not constrain responses. This reduces the risk of excluding essential information. It provides opportunity for creativity, self-expression and the thinking of respondents to be communicated. Partially open-ended questions create the possibility for respondents to provide a response left out by the researcher. This does not occur in the case for close-ended questions. Therefore, in order to gather a whole range of responses, the use of all three types of questions (close-ended, open-ended and partially open-ended questions) was appropriate for this study project. Table 1 reports sample details.

Table 1: Sample Details			
	Eirke Village	Awak pah Villlage	Total
Total households	30	25	55
Sample households	14	13	27
Sample %	47%	52%	49%

Eirke and Awak pah Villages

Selection of Case Study Area

It appears Awak pah and Eirke villages are representative villages. They appear to have similar use of the forests. Eirke and Awak Pah are good examples of communities that appear to depend heavily on the forests for their subsistence. The community members' future with regard to land and resource use is uncertain. Kava has become commercialised, and demand has increased tremendously. This increased the exploitation of the upland forest resources.

Eirke village and Awak pah were selected because their size and location made face-to-face interviews feasible. There is no mailing system in the villages. There is only one main postal service which is located in Kolonia town. The lack of public transportation limited access to further villages.

Eirke Village

Eirke village is situated within Nett municipality. A paved road runs 10 km south of Kolonia past the Nett District Government to Eirke village. The road follows the passing Kahmar River. The Nanpil River runs through the village and provides protein sources such as fish and shrimps.

Awak Pah Village

Awak Pah village is the first village in the municipality of U. Awak Pah village is about 20 minutes drive south of Kolonia. There are no major streams or rivers which the villagers depend on. They rely on the ocean for fish and other sources of protein.

Socio-economic characteristics of the Villages

Community members lack full-time employment from the public and private sectors due to a lack of education. The villagers' classification of occupation is reflected in Table 2. They range from being farmers to taxi drivers and so forth. The majority (21 per cent) of the villagers are farmers; twelve percent housewives; seven percent classified their employment as other where they work as taxi drivers, line men, and so forth; and almost half of the household members are students (39 per cent) and children (10 per cent). The village members often do not last long in the private or public sectors as they do not like timely schedules. They work on flexible schedules, and are used to the traditional life style of being relaxed and laid back.

Table 2: Employment classification

Occupation	Total	Percentage
Farmer	39	21%
Housewife	22	12%
Student	71	38%
Government	4	2%
Health & Education	2	1%
Construction	5	3%
Wholesale & Retail	3	2%
Fishing & Agriculture	7	4%
Hotel, restaurant & bar	2	1%
Manufacturing	1	1%
Retired	4	2%
Other	6	3%
Children	18	10%

Each household has approximately two to three hectares of land. Out of the 27 households interviewed, 15 families raise pigs, nine households own chickens and dogs are raised by almost all of the households. Pigs are the most important and popular animal in Pohnpei followed by dogs and chickens. Pigs and dogs are significant as they are used during traditional occasions. The three most important items that a commoner brings to a traditional occasion are kava, yams and pigs or dogs.

Most of the farmers are young without any formal education. They lack understanding of sustainable forest management. As a result, they apply unsustainable farming practices and skills, which have generated greater pressure on existing resources (Raynor, 1996).

The education system in Pohnpei is modelled after the United States educational system. However standards are not high. The educational achievement has increased between 1980 and 1994. In 1994, it was reported that approximately 94 percent of the population aged 10 and over are literate. The proportion of the population completing some level of education has increased with the proportion with no schooling decreasing from twenty-five percent in 1980 to 15 percent in 1994. Education achievement is not high with nearly fifty percent of the population only attaining elementary education. Eighteen percent achieved high school or a higher level of education. Twelve percent of adults aged 15 years and over and 19 percent of adults age 45 and 54 achieved vocational training. Overall the literacy status decreased with age showing that the older generation did not have the educational advantages of the younger generation.

The status of the health of community members is critical. School children are often under-nourished and unhealthy. Health problems cause frequent absenteeism and learning difficulties. Generally, the village diet has deteriorated with the introduction of processed and packaged food. There has been an increase in malnutrition, hypertension, diabetes and other nutrition related diseases due to increased consumption of foods high in fats, salts and other undesirable chemicals, however low in nutritional value. In addition, the Health Services Plan for the FSM stated infant mortality rate is decreasing, as well as respiratory system disorders (ADB, HRD Study 1995). However, there has been an increase in diseases relating to the circulatory system, cancer, and prenatal related diseases. The majority of these diseases are related to improper nutrition. Overall, there is tremendous need in both education and health care systems in Pohnpei.

Community Members and the Forests

The survey results show 100 per cent of the villagers are familiar with the forests. The households visit the forests up to thirty times per month. Households visit the forests on average 7.0 times per month. On these visits, they spend up to 720 hours in the forests. On average, the households spend 139 hours per month in the upland forest.

In Awak Pah village only 3 per cent of the household cultivate kava in the upland forests. The remaining households work in the lowland areas where they cultivate agroforest products. As for Eirke, 100 per cent go to the upland forests and cultivate kava. The research result shows that on average, each household visits the forests 10 times per month searching for land and 7 times per month planting kava in the upland areas. Planting kava occupies a significant amount of the villagers' time (460 hours per month), which is followed by planting yam (146 hours per month) and searching for land (82 hours per month).

There are three major uses of the upland forest identified by the villages. Research results show that majority (74 per cent) of the 27 households consider that planting kava is the most important use of the forests (first category). As to second most important activity, planting yam was given by 33 percent of the interviewed

households (second category). Breadfruit was suggested by 22 percent as the third most important activity. The most important uses of the forest relate to their significant traditional uses. The major uses of the forests are reported in Table 3.

Table 3:		
The Most Important Use of the Forests (first category)		
Item	Households	Percentage
Kava	20	74%
Yam	3	11%
Banana	1	4%
Breadfruit	2	7%
Coconut	1	4%
The Second Most Important Use of the Forests (second category)		
Kava	4	15%
Yam	9	33%
Banana	3	11%
Breadfruit	4	15%
Dryland.Taro	3	11%
Wetland Taro	1	4%
Swamp Taro	2	7%
Coconut	1	4%
The Third Most Important Use of the Forests (third category)		
Yam	3	11%
Banana	4	15%
Breadfruit	6	22%
Dryland.Taro	2	7%
Swamp Taro	4	15%
Coconut	3	11%
Pig	3	11%
Tapioca	1	4%
Pineapple	1	4%

The majority of the households interviewed stated concern regarding the wildlife that they depend on. The population of birds has decreased which could result from loss of forest cover and an increase in hunting.

There are three major ways of hunting in Pohnpei, namely shooting, use of breadfruit sap and traps. The majority of the interviewees confirmed that they hunt birds by shooting, especially when it is wet. This is due to birds being less alert. In addition, the majority prefer hunting birds early in the morning. The village members use slingshots and rifles. Breadfruit sap is used in hunting birds. They generally use the sap during fruit bearing season. Traps are designed for wild pigs, deer and chickens. Bigger and stronger traps are used for wild pigs and deer. The traps for chickens are smaller and other hunting tools used are strings and coconut meat (as bait). Dogs are also used to hunt wild pigs, deer and chicken.

Perceived dependency on the forest is reported in Table 4. Seventy-five percent of the households interviewed responded that the current level of dependence on the forests is much more than that of 10 years ago. Seventy percent of the households interviewed responded that the current level of dependence on the forests is much more than that of 20 years ago. Sixty-seven percent responded saying that their current level of dependence is much more than 30 years ago. These results indicate that villagers perceive their dependence level on the forests increasing when compared to recent decades. This is consistent with the key motivation to go upland to plant kava.

<u>Dependence Level</u>	<u>Time</u>			
	<u>10 yrs</u>	<u>20 yrs</u>	<u>30 yrs</u>	<u>Future</u>
much less	0%	11%	3%	4%
little less	11%	7%	0%	15%
The same	4%	5%	4%	3%
much more	75%	70%	67%	19%
Not known	10%	7%	26%	59%

As for the villagers' future, it is unclear or unknown. Fifty-nine per cent of the villagers from both Awak Pah and Eirke answered that their dependence level on the forests is unknown. They are aware that the forests are diminishing in size. This awareness may be from their own observation or because of the 1995 Watershed Management Project Workshop and the launch of the Low Grow Campaign in 2000. This project encouraged Villages to plant kava in the lowland areas rather than in the upland forests. The lining of the Watershed Reserve boundaries was also important. This clearly showed the boundaries of the Watershed Reserve indicating the off limits areas. This limits the villagers' access to the upland forests.

The research shows that Awak Pah village has more options than Eirke village. When asked what they would do if they are unable to use the upland forests 100 per cent of the households in Eirke replied they would return to the lower land area. As for the Awak Pah village, forty two percent of the interviewed households suggested they would pass on the land to their children to cultivate, and they would cultivate other crops. Twenty eight percent stated they would look for job, and would cultivate in the lowland area (each future option has 14 percent). Seven percent said they would go into fishing, while seven percent would retire from being just farmers and seven percent did not respond. The breakdown for future options for Awak Pah is shown in the Table 5.

<u>Future options</u>	<u>Count</u>	<u>Percentage</u>
Cultivate in low land=1	2	14%
Children will cultivate=2	3	21%
Cultivate other crops=3	3	21%
Look for job=4	2	14%
Retire=5	1	7%
Fishing=6	1	7%
No response	1	7%

Current Management of the Upland Forests

When asked about the current management of the upland forest, 56 percent of the households interviewed are not satisfied, while 33 percent are satisfied and 11 percent did not give any comments. The majority of the household members interviewed have concerns about the use of the upland forest in the future. Their major concerns constitute the following: 40 percent perceive deforestation as the major concern, 22 percent of the interviewed households are concerned with water pollution; and 11 percent are concerned about population growth. Four percent believe the future use of the forests lies within educational awareness workshops, which would emphasize the importance of keeping the forests untouched. Some households are also concerned

about unproductive crops due to deforestation, uncertainty about future generations' use of the forests, decreases in soil fertility and decreases in the number of streams. These households believe these impacts will limit the use of the forests in the future.

**Table 5: Villagers' Major Concerns
on the Future Use of the Forests**

Major Concerns	Percentage
Deforestation	40 %
Water Pollution	22%
Importance of forest	7%
Education Awareness	4%
Population growth	11%
Unproductive crops	4%
Uncertainty on future forest use	4%
Decrease in streams	4%
Soil fertility	4%

Kava planting is not the only cause of upland forest clearing. The research result show that other activities in the upland forests are: bird hunting, deer hunting, wild pig hunting and searching for new land. These activities occupy less of the villagers' time compared to kava planting. This suggests that kava planting is the major activity generating pressure upon the upland forests resulting in deforestation. Research result indicates the hunting of wild pigs, deer and birds is declining. This could mean that their population is decreasing. As more and more kava growers and hunters move upland, hunting of these wild animals become popular leading to their decrease in population which could result in more detrimental impacts such as species becoming severely stressed and eventually endangered.

Decline in Forest Resources

Decreasing Wildlife

A study conducted Raynor (1996) suggested that hunting of birds, namely the Micronesian Pigeon (*Ducula ocellata*) and the Caroline Islands Ground Dove (*Gallicolumba kubaryi*) was popular in the past. Over-harvesting has caused dramatic population decline. Hunting has increased from the population increase coupled with the availability of rifles and the introduction of a cash market for some species. Raynor also noted that poaching is common, while enforcement is weak. There is existing legislation protecting the Micronesian Pigeon, but people still hunt them (Raynor, 1996).

The effect of hunting is not limited to the Micronesian Pigeon. Coastal and off-shore island nesting seabirds, flying foxes, and other small forest birds, namely Micronesian starlings (*Aplonis opaca*) and Purple-capped Fruit Doves (*Ptilinopus porphyreus*) fall prey to hunters. The Pohnpei Lory or "Serehd" (*Trichoglossus rubiginosus*), the State bird is fully protected (Designation of State Bird SL No.2L-90-81). It is seldom hunted even though numbers of this certain species appear healthy (Thomas, 1996).

In 1995, the College of Micronesia conducted a questionnaire survey on the deer population coordinated by Mr. Don Buden. The results were not conclusive due to the lack of understanding of the ecology and dynamics of the small deer population. Nonetheless, they do provide valuable anecdotal information on hunting techniques, the venison market, the downward trend in numbers and an upward movement in hunting effort per animal killed (Thomas, 1996).

The impact of agriculture and other activities

Searching for new land in the upland forest areas is common among kava growers. Land is very important to the kava growers as the soil is rich in nutrients, which enables faster growth rate for the kava plants. The research results show that villagers spent an average of 31 hours per month searching for new land in the upland forests. It appears that the commercialisation and the increased demand of kava has caused the kava growers to go upland where kava is perceived to grow better. As a result, this leads to deforestation in the upland forests.

In 1983, the USDA Forest Service and local foresters conducted an extensive vegetation survey. The survey result showed the original area (24,789 hectares of forest land) had declined to an estimated of 19,683 ha or 55 per cent, and by 1995 to 16,081 ha or only forty-five per cent of the island. Using the Intact Upland Forest category developed for the 1995 survey, only 15,000 ha (42 percent) of the island was covered in 1975 and this area has decreased dramatically to 5,162 ha (fifteen percent) by 1995 (Thomas, 1996).

Raynor (1994) suggested kava planting is the major cause of deforestation. Other causes include human settlement in the upland forest, tourist trails, and economic development. Other activities also occupy the villagers time and effort. In Eirke village, the majority of the villagers obtain wood from the upland forests mainly for constructing houses. As for Awak Pah village, the majority of the households obtain wood from the mangrove areas mainly for housing materials. This is because the two villages are located in different areas. For instance, Eirke is more in the upland and rural area, while Awak Pah is a coastal area. In both Awak Pah and Eirke, yam occupies most of the villagers' time (an average of 20 hours per month). In Eirke village, tapioca is the second major activity (occupying the villagers' time at an average of 20.5 hours per month); followed by swamp taro (16.8 hours per month). As for Awak Pah, banana ranks as the second most major activity (6.3 hours per month), followed by breadfruit (6 hours per month).

One of the key strategies in addressing cultivation of kava in the upland forest is a Grow Low Campaign being carried out by The Nature Conservancy (TNC) and local partners. Through this effort, 1000 farmers, two high schools, three elementary schools and three commercial nurseries have set on a mission to cultivate over 1 million kava plants in the lowland areas (Kostka and Raynor, 2000). The TNC also proposed to carry out biennial monitoring of forest clearing activity mainly to monitor the effect of the Grow Low Campaign and other factors of the kava strategy such as Community Planning Program, Community Conservation Officer Program, Watershed Forest Reserve boundary line survey and so forth. The objectives of the monitoring approach are to design a community-based monitoring program, which is both resource-efficient and practical and could be applied in management decision-making. The monitoring approach mainly focused on forest clearings. This was pioneered by TNC in 1998 in two forest areas, Senpehn, Madolenihmw, and Eirke, Nett (Kostka and Raynor, 2000). There are differences in new forest clearing activity between areas where the Watershed Program has been active and those where the Watershed Program has not yet begun (Kostka and Raynor, 2000).

Forest Products

Non-wood forest products are important in both villages of Eirke and Awak Pah. The non-timber forest products provide subsistence despite most of the non-wood forest

products not entering the market. It is difficult to quantify their market values. The non-timber forest products are classified into three major categories namely, aquatic and wildlife animals, herbal medicine, and construction and fuel materials.

Table 6 shows total monthly quantities (for the 27 households interviewed) and the average monthly quantities (per household) of wildlife such as deer, pig, bird and chicken. Each household harvests an average of 71 kg of deer and 159 kg of pigs.

Eirke and Awak Pah villages depend on different sources of fish and shrimp protein. Eirke depends on the river, while Awak Pah relies on the ocean. This coincides with the location of the two villages. Eirke is in the rural upper land, while Awak Pah is in the coastal area. Fresh water and sea fish, along with shrimps are part of the villagers' diet. As shown in Table 6 each household is estimated to catch an average of 13 kg of shrimp and 41 kg of fish per year. Both villages prefer fish to shrimp. The reasons being fish has more meat. Both villages expressed the view that the population of fish and shrimp has decreased.

Table 6
Monthly Quantities of Non-timber Forest Products:
Wildlife and Aquatic Animals

Item	Unit	Total Q.	Average Q.	Min	Max	Std dev
Bird	head	115	14.4	5	20	5.6
W. Deer	Kg	285	71.2	65	75	4.8
W. Chicken	head	121	8.1	5	12	2.6
W. Pig	Kg	1115	159.3	90	250	59.3
Fish	Kg	545	41.9	28	63	12.8
Shrimp	Kg	80	13.3	10	18	2.7

Monthly Quantities of Non-timber Forest Products - Construction and Fuelwood

Item	Unit	Total Q.	Average Q.	Min	Max	Std dev
Firewood	Bundles	1473	64.0	20	120	32.3
Woods	Stem	738	35.1	6	100	18.7

Monthly Quantities of Non-timber Forest Products - Herbal Medicine

Item	Unit	Total Q.	Average Q.	Min	Max	Std dev
Medicine	Plant	96	6.9	4	20	4.6

Firewood and other use of wood

Firewood is referred to as anything that can be burnt such as small branches and chopped wood. They do not have timber value. Firewood is used daily mainly for family consumption, specifically for cooking meals. It is collected in bundles both by men and women. It may take from 30 minutes to 2 hours per trip to collect firewood. The time to collect firewood depends on the availability of firewood and the distance from home. Some may collect it on a daily basis, while others may spend up to half a day for 3 to 6 months use.

Ais trees grow tall to a height of 80 to 100 feet (25-30 m). They bear large, round reddish-brown fruit 2-3 inches (6-8 cm) in length. The hard wood is rot resistant and is commonly used in constructing houses. This is true especially where mangrove trees are not available, and this is what Eirke villagers rely on for building houses.

The *katar* trees grow to a height of 25 to 30 feet (8 to 10 m), with a black, thick and fibrous trunks that have soft inner core. The inner core of *katar* is durable, and can remain in the soil for as long as 20 years before rotting. They are commonly used in building houses in Pohnpei. Pohnpeians also use the trunks of *katar* to support commercial black pepper vines (*Piper nigrum*) and for fence posts. The *katar* population has drastically decreased due to population growth, increase demand for housing materials and pepper plantation.

Fruits

Kirek en wel (*Eugenia stelechantha* – *Myrtaceae*). The edible fruits of this tree of Pohnpei is smaller but is similar to those of its close botanical relative, *Apel* (*Eugenia malaccensis*). *Apel* is also edible. *Nihn*, the native fig tree also has edible fruits. *Kotop* (*Clinostigma ponapensis*) is a source of food and medicine. It is used by hunters in the upland forest as food, the heart of the palm. There is a well-known story about the light-colored flowering parts of *kotop*. Warriors that came from Kosrae spotted many palms in flower in the mountains as they approach the island of Pohnpei. They mistook the light-colored flowering stalks as men’s skirts made from *keleu* (*Hibiscus, tiliceus*). These are the major edible fruits in the upland forest. They are only collected and consumed when hunters or farmers visit the upland forest. Consumption is dependent upon availability and visits by farmers or hunters. Overall, these are used for village members’ consumption. They are not traded or sold in the markets.

Herbal medicine

Medicine is collected by both men and women from the forests, as well as the lowland areas. Herbal medicine is significant within both villages. The village members claim medical treatment at the Pohnpei State Hospital is expensive, however when they pay tribute (known locally as *ilisapw*) for their herbal medicine treatment, it is far more expensive. It takes a total of eight days to treat a sick person with local herbal medicine. In severe cases, it may take up to a month. The payment process involves paying after every four days. For the first *ilisapw*, the sick person would bring kava and other food items to the local doctor. The value of the items presented with *ilisapw* could be USD\$50.00. The length of treatment depends on the seriousness of the sickness. A total of eight plants could mix together to treat a sickness. In each village there are quite a number of local doctors. Table 7 reports the names of common herbal medicines and their treatments.

Table 9: Herbal Medicines and Treatments

Pohnpeian Names	Medical Treatment
Kurum	Skin disorder
Kamal	Magical medicine
Keleu	Cure
Kotokotasahu	Restores memory
Liwekidenlol	Cure heartbroken
Pisetikmei	Cure shingles, use to increase children’s appetite
Remek	Cure womb illness
Wihnmar	Relieve pain after birth
Wei pwul	Treat diabetes
Sei en wai	Treat coughing
Apwid	Treat ear infection
Topwuk	Treatment for various skin diseases
Rehdil	Use for healthy development in young children

Villagers' Major Use of the Upland Forest Resources

When asked about how the villagers use the upland forest products, ninety percent use the products for sale and sixty-three percent for family use. None of the interviewed households trade or exchange their products for any other goods or services. Selling of the product takes place in the markets (70 percent), an in other places (22 percent). Other people may order, or the villagers sell their products at the public schools or at the Pohnpei State Hospital. Seven percent sometimes sell their products within the village. These results are reported in Table 8.

Table 8		
Major use of the Forest Products		
Use	Total	Percentage
1. Trade	0	0%
2. Sale	25	93%
3. Family	17	0%
4. Other	0	
Trade Places		
Market	19	70%
neighborhood	0	0%
Within village	2	7%
Other	6	22%

Transport to the markets is reported in Table 9. When selling their products, sixty-three percent of villagers use a taxi service as a source of transportation. Twenty-two percent of the villagers own private cars, and 4 per cent use privately owned boats. It costs an average US\$2.33 per farmer when they take a taxi to sell their products. There are additional costs (an average of US\$3.65). It takes an average of 1.5 hours for the villagers to take their products to the markets and return even though it is quite close.

Table 9					
Transport to market place centre					
Transport	Total	%			
Foot	0	0%			
Taxi	17	63%			
Own car	6	22%			
Boat	1	4%			
Other	3	0%			
Transport cost and time					
	Count	Mean	Min	Max	Std
Transport cost	17	2.12	2	4	0.49
Time to markets hrs	25	1.48	0.5	4	0.80
Additional costs	19	0.84	0	1	0.37
Extra costs	16	2.81	1	20	4.65

Value of Forest Resources for Eirke and Awak Pah Villages

There are major difficulties associated with valuation of forest products (actual monetary value of each good sold). Community members do not sell all the forest products. They consume them as well. The majority of the households stated their dependence on forest products for both cash and family consumption. The value of the forest products are calculated using weighted average price based on responses given by the households. The weighted average price is calculated to value the total quantity of forest products.

Table 10 shows that forest products contribute at least US \$9,262 to the villagers per month. This is based on the actual prices that villager get when selling their non-timber forest products. As reflected in the table, construction and fuel wood. They are not sold in the markets, as they are only used by community members. This does not mean that they do not possess any economic value. Wildlife alone contributes US\$ 2,134 per month and kava generates \$7,128 per month to the villagers of Eirke and Awak Pah.

Table 10: Estimated Monthly Value of Forest Products to Eirke and Awak Pah

Items	Herbal medicine and Kava	Aquatic & Wildlife Animals	Construction & Fuel woods	Total of NTFP
US\$ Dollars	\$7,128	2,134	Important but not estimated	\$9,262
Percentage	77%	23%	-	100%

Other Sources of Income and Agricultural Products

In addition to the income generated from forest products discussed previously, village households earned additional income of US\$6,033 per month. This cash income is earned from wages and salaries as taxi drivers, construction workers and so forth.

The monthly monetary value of agricultural production for all households in the two villages is approximately US\$ 11,781.

Overall, there are three major sources of income for Eirke and Awak Pah villages. These include monetary revenue earned from non-forest products, income from agricultural production and other salaries. These are reported in Table 11.

Table 11: Estimated Total Annual Income by Village and Household

Sources of Income	Eirke and Awak Pah Villages	Per Household	Total Income (Percentage)
NTFP	\$9,262	\$168	34%
Agricultural crops	\$11,781	\$214	44%
Wages and Salaries	\$6,033	\$109	22%
Total	\$27,076	\$491	100%

Table 11 shows that out of the total monthly income of US\$ 27,076 generated by the two villages, forest products contributes 34%, agricultural products 44% and wages and salaries 22%. This shows the two villages depend heavily on the forests for income.

Conclusion

Pohnpeians are heavily dependent upon the forests for their wellbeing. They benefit for medicine, kava, agricultural crops, wild animals and wood for energy and construction. This dependence is at risk because use is leading to forest damage and clearance. Although much of the blame has been attributed to kava production policy should be careful not to target kava production in isolation. If kava production is reduced but people use the forests for banana production there may not be any gains in forest protection. Likewise it is not appropriate for policy makers to focus on the upland forests in isolation. Pohnpeians gain benefits from the use of upland forest, lowland forest and other land. Improving availability and productivity from other land sources is potentially an important way to reduce the pressures on upland forests. Likewise increased availability of alternative production and income sources will reduce pressure on the forests. Although increased regulation in conjunction with traditional managers may enhance forest protection it is important analysts carefully examine the potential for activity relocation.

The value of forest protection was estimated by talking the survey values and multiplying them by current market values where product is traded. Where product is not traded (as in the case of firewood) no values were estimated. Although more sophisticated valuation techniques can be pursued it was deemed inappropriate at this time given the quantity and quality of data available.

References

- Anson, H. and W.C. Raynor, 1993. Traditional Resource Management and the Conservation of Biological Diversity on Pohnpei Island, Federated States of Micronesia. In Hamilton, L. editor. *Ethics, Religion and Biodiversity: Relations Between Conservation and Cultural Values*. The White Horse Press, Cambridge, UK.
- Ashby, G. 1990. A Guide to Pohnpei: An Island Argosy. Rainy Day Press, Eugene, Oregon.
- Engbring, J., Ramsey, F.L., and Wildman, V.J. 1990. Micronesian Forest Bird surveys, The Federated States: Pohnpei, Kosrae, Chuuk, and Yap. US Fish and Wildlife Service, Department of the Interior, Washington, D.C.
- Gallen, J. Sakau and Forests: The Challenge of Sustainable Upland Forest Management in Pohnpei, Federated States of Micronesia. Unpublished Master of Management Studies Dissertation, Waikato University, 2002.
- Kostka, M. and Raynor, C.W. 2000. Pohnpei Forest Monitoring Report. Pohnpei, FSM.
- Merlin, M., Jano, D., Raynor, W., Keene, T., Juvik, J., and Sebastian, B. 1992. Tuhken Pohnpei, Plants of Pohnpei. East West Center, Hawaii.
- Raynor, W.C. 1994. Resource Management in Upland Forests of Pohnpei: Past Practices and Future Possibilities. ISLA: A Journal of Micronesian Studies, 2:1. Rainy season, 1994. University of Guam
- Raynor, W.C. 1996. Senpehn Case Study: Developing a Common Approach to Watershed Planning on Pohnpei. Prepared for Asian Development Bank T.A. No. FSM-1925: Watershed Management and Environment.
- Thomas, P. 1996. Biodiversity Management Needs for Pohnpei's Watershed Area. Prepared for Asian Development Bank T.A. No. FSM-1925: Watershed Management and Environment.