

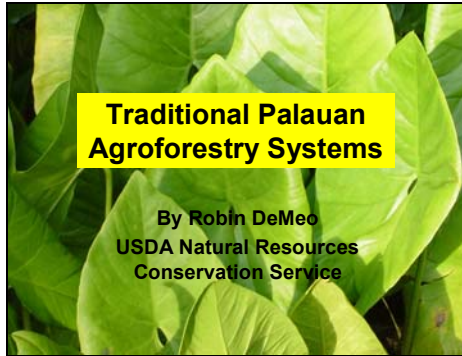
Traditional Palauan Agroforestry Systems

Trees for Improving Sustainability, Resource Conservation, and Profitability on Farms and Ranches

Koror, Palau June 26-27, 2006

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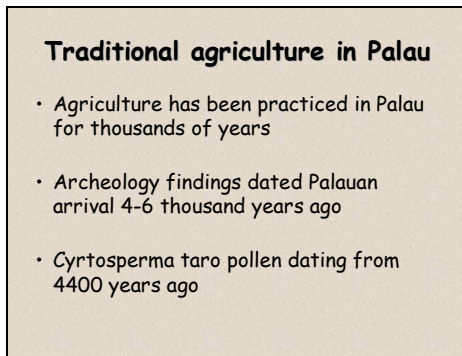
Overview of the traditional Palauan agroforestry system

The modern agroforestry system in Palau or backyard garden or tree farm

Recent commercial or monoculture agriculture systems

Summary of what works, or what practices used in the different system are sustainable and what are not

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Agriculture has been practiced in Palau for thousands of years.

Recent archeology findings have dated Palauan arrival to be four to six thousand years ago.

They have found *Cyrtosperma taro* pollen dating from 4400 years ago.

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Mesei location

- Same location has been cultivated continuously year after year
- Mesei taro cultivation is in wetlands
- Village share the mesei

The same location has been cultivated continuously year after year, generation after generation.

Taro was cultivated in wetlands or near rivers and streams, where flowing water could be utilized.

Most taro plants grow in “patches” found in the lowland swamp.

Some “patches” are upland by streams. Rivers or streams must be nearby in order for wetland taro to survive.

Typically the women of the village share the wetland and share the work of maintaining it.

There are taro varieties that grow in drier places. The original swamp forests and wetlands were altered long ago to cultivate taro. An abandoned patch will revert back to a wild wetland if not maintained.

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Mesei system passed down

- Women's role
- Passed from mother to daughter
- Over many generations

Systems are passed down from one generation to the next.

Women have the role of propagation of taro, including swamp taro, in the traditional Palauan society.

Passed down from mother to daughter.

Over many generations intensive taro cultivation systems were maintained.

As recently as one generation ago all women had to produce taro, and agriculture is and always has been the work of women.

The lagoon is considered the territory

of the men, the swamp and the cultivation of taro is considered the women's territorial activities.

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Mesei taro cultivation

- Mesei taro cultivation was the most prevalent form of agriculture
- Taro was the main source of food
- Mesei system made up of many species

Mesei taro cultivation was the most prevalent form of agriculture historically. Mesei taro was extensive, carefully layer out, and tidily kept.

Taro was the main source of food in the Palau Islands. Taro is still the most important starch food in Palau and is always served at customary feasts.

The taro diversity has expanded under this system and resulted in over 100 taro varieties.

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Here a Palauan woman works in her taro patch.

The depth of mud inside a patch can be up to your ankles or all the way up to your waist.

There are two basic types of taro: *Colocasia esculenta* or kukau is the main taro species of importance, considered the "Mother of Life". It is small grayish purple taro, called kukau. The purple taro can grow over 2 meters high.

The other taro type is the large yellow taro, *Crytosperma chammissions*, or

swamp taro, called *brak*. The yellow taro can grow over 3 meters high.

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Mesei water management

- Dike system
- Water management from streams
- Channels for water lead into and out

The taro patch is a depressed, wet and muddy place surrounded by an elevated earthen mounds or dikes.

The women of the village work together to build and maintain the dikes system.

Small streams and channels of water lead into the patch or along side it.

The water ditches and feeder streams are cleared of plants so water can freely flow into the patch.

Small ditches are dug along the inner periphery to allow water to move within the patch.

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Several taro patches with taro at different stages, planted in succession to provide continuous food supply

Patches may be rectangular or square in shape and connect to other taro patches.

Drainage ditches called *bong* surround taro patches.

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Mesei cultivation

- Mesei taro is very labor intensive
- Weed plants and young trees are removed or pushed into the mud as fertilizer
- Wood ashes, twigs and leaves are added to control insects, fungus and bacteria and for fertilizer
- The mesei is turned and worked
- Taro plants are harvested and the stems used for replanting. Each new taro plant is pushed into the mud

Preparing an overgrown taro patch is very labor intensive for kukau.

Tall grasses and sedges, weed plants and young trees are removed or pushed into the mud as fertilizer.

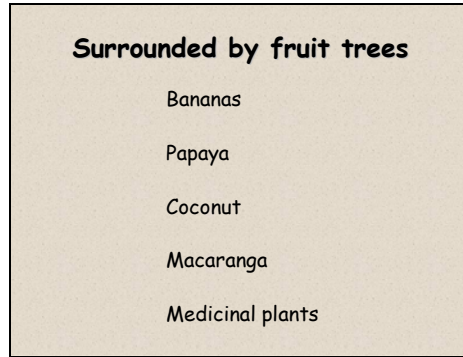
The mesei is turned and worked, which requires the women to dig down as deep as they can with their hands and up lift the mud to turn it over.

Wood ashes, twigs and leaves are added below the mud to keep insects, fungus and bacteria away and for fertilizer.

Existing taro plants are harvested and the stems put aside for replanting.

Taro is planted when the patch is ready and the time is right. Each new taro plant is pushed into the mud. The spacing between plants varies for each woman. The greater the spacing between plants, the larger the tuber will grow.

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A healthy taro patch is maintained regularly.

Women also tend to their fruit and medicinal tree which are planted and maintained around the mesei for food and medicine and for a source of mulch material.

Many species make up this system with taro as the primary species.

Some of the species found planted around the mesei are bananas, papaya, coconut, macaranga, and medicinal plants.

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Here is a example of a mesei with brak taro, bananas, coconut and betel nut.

The Mesei system of agriculture is sustainable and can be continuous on the same location generation after generation.

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Use of leaf mulch

- Once the taro is planted, banana leaves are placed between the rows to reduce weed growth
- Weed control
- Organic matter input
- Organic fertilizer

Once the taro is planted, banana leaves are cut and placed between the rows to reduce weed growth for the first three months or till the plants get too close and shade out the weeds themselves. Weeds are removed periodically during the grow-out period.

Bananas and other trees are planted around the mesei and used for mulch for weed control and to build organic matter in the patch to add organic fertilizer to the mesei.

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The purple taro kukau (Colocassia) plants are surrounded by cut banana leaves or leaves of other nearby trees.

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Ked or Open Canopy

Cassava
Sweet potatoes
Upland taro
Pineapple
Lemon grass

The open canopy agricultural system has also historically been practiced on the Ked or grasslands.

This involves burning the grass, turning the soil, and hoeing ridges along the contour to reduce soil erosion.

The main crops in this system were cassava, sweet potatoes, taro, and pineapple. Lemon grass is planted as a border and to prevent soil erosion.

Crop rotation helps maintain fertility and limit species-specific pests.

However, after several years the Ked agriculture system requires a fallowed period to rebuild the soil. It is not sustainable or continuous.

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Subsistence agriculture is still the dominant form of agriculture production in most of Palau and the traditional cultivation system is still practiced.

However, more of the farms are larger scale commercial farms and many use chemical fertilizers, equipment and agricultural chemicals.

As lands are opening up with the near completion of the Compact Road more and more areas are opening to farming and more and more commercial farms are using agricultural chemicals.

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Changing agriculture in Palau

- Declining population
- Declining demand for food
- Declining labor force to maintain the mesei system

The population of Palau decreased with European contact and was at its low point after WWII, about 6,000.

With the decrease in population there was also a decrease in demand for food and people to labor in the taro patches. This has caused a shifting away from intensive mesei cultivation toward backyard gardens and ked farming.

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Upland agriculture

- Dry land agriculture systems
- Monoculture
- Larger areas

Upland agricultural systems focus on crops which will grow in the acid soils of Babeldaob, such as cassava, and tree crops, bananas, etc.

In the 1990's there was a sharp increase in the import of foreign labor to Palau.

In recent years the trend is toward hiring foreign nationals or contract workers such as Filipinos, Bangladeshi, and Chinese to work the farms.

These farmers bring with them the farming techniques from their home country and often farm larger areas of single crops or monoculture.

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Large tillage area on sloped field.

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Crops

- Taro
- Cassava
- Sweet Potato
- Cabbage
- Cucumber
- Tomatoes
- Radish

Production of the crops such as taro and cassava have increased in the 1990's.

Cassava production increased up to 10 times in 9 year period due to its suitability to the non fertility soils and export market.

Other crop also increased in production also up to 15 times in the same period.

Other crops which also increased in production are banana, papaya, and

pineapple.

Oranges, tangerines, and soursop started to be sold in the markets in Koror after only being for personal consumption.

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Chinese farmer using contour farming growing eggplant and cabbage.

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Tillage up and down the field on and large area

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Agroforestry or backyard

- Over 2000 agroforestry type farms in Palau
- Backyard farms
- Multi storied
- Mix trees and crop plants
- Highly diverse

Agroforestry or backyard gardens are extensively practiced in Palau.

There are approximately 2880 backyard or agroforestry type farms in Palau, according to the 1994 Ag census.

These are multi-storied, mixed trees and crop plants, and highly diverse

These are mostly small (less than half an acre) subsistence farm with a variety of food crops in mixed agroforest systems.

There are also many small scale livestock operations raising pigs and chickens.

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Agroforest system with bananas and casava

Agroforestry systems require little energy input and can provide a supply of tree and crop products from the marginal lands here in Palau, over a long period of time.

These mixed forests are called chereomel and consist of a wide range of food, fruit and timber trees and crop plants and medicinal plants.

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Agroforest ground crops

- taro
- sweet potato
- kang kum
- pumpkin
- bean

cassava
yams
squash
melon
pepper

The typical crops in an agroforest or backyard garden include taro, peppers, cassava, pineapple, sweet potato, sugar cane, yams, okra, Piper betle, and tree crops.

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Agroforestry tree crops

- coconut
- banana
- papaya
- lemon
- keam
- guava
- breadfruit

mango
betelnut
starfruit
mountain apple
football fruit
titimel
ngel

The typical agroforest tree crops include coconuts, bananas, citrus, papaya, mango, breadfruit, avocado, tropical almond and medicinal plants, betel nuts, Inocarpus fagifer, Panguim edule, or ngel.

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Agroforest system with kukau taro in the foreground, onions, brak taro in the back ground and betel nut

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Summary

- Mesei system of agriculture is still practiced in Palau but less than historically
- Large scale upland agriculture is increasing
- Agroforest systems are practiced in backyard systems
- Each of these systems have practices which are sustainable

Mesei system of agriculture has been sustainably practiced for thousand of years, it is still practiced in Palau but less than historically.

Large scale upland agriculture is increasing.

Agroforest systems are practiced in backyard systems.

Each of these systems have practices which are sustainable.

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Unsustainable Practices

- Large areas of uncovered soil
- Soil erosion
- Steep slope tillage
- Use of chemical fertilizer without organic matter addition

Unsustainable Practices:

Large areas of uncovered soil

Soil erosion

Steep slope tillage

Use of chemical fertilizer without organic matter addition

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Sustainable Practices

- Keeping the soil covered
- Minimize soil erosion, contour farming & residue management
- Green Manure to build soil fertility
- Water runoff management
- Mulch
- Multi species plantings, Agroforestry

Sustainable Practices:

Keeping the soil covered

Minimize soil erosion, contour farming and residue management

Green manure to build soil fertility

Water runoff management

Mulch

Multi species plantings, agroforestry

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Cassava with permanent ground cover of grass around the plot to lessen the area of soil exposed and minimize soil erosion and to act as a filter for soil in the water runoff.

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Contour farming is an important practice on all sloped fields to help to lessen soil erosion.

However, any bare soil in Palau will cause unsustainable levels of soil erosion.

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Residue management in the fields helps provide the needed organic matter to the soil, adds fertility to the soil, and slows soil erosion from this field.

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Sunn Hemp used as green manure to build soil fertility and minimize soil erosion between crops.

Keeping the soil covered at all times is very important in Palau where we get 150 inches of rain and erosion is high.

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Mulch use in the mesei has help make that system of agriculture sustainable for thousands of years.

Mulch use in the upland systems and in agroforest is also important to make these systems sustainable.

The soil needs to remain covered by living or decaying vegetation at all time to remain productive.

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The multistory agroforest system is a sustainable system with the few outside inputs.

The leaf litter provides the mulch and fertilizer.

The mix of crops and trees provide a variety of products, such as Cassava, sugar cane, betel nuts, and bananas.

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Thank you, any questions?