

Report on the Visit to the Pohnpei Atoll Island of Mwoakilloa

Documenting and Promoting Local Food Crops

November 21-24, 2003



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Contents of Report

Background

Aims

Preparations

Community Meeting

Other Data Collection

Further Work and Recommendations

Summary Provided to SPC for distribution to PAPGREN members

Costs

Reference

Appendix 1 Participants in the Mwoakilloa Community Meeting

Appendix 2 New Recipes Presented by Ms. Yumiko Paul to the Mwoakilloa Community

Appendix 3 Giant Swamp Taro (*Cyrtosperma chamissonis*) *Mwehng* Cultivars

Appendix 4 Pandanus (*Pandanus tectorius*) *Kipar* Cultivars

Appendix 5 Banana (*Musa sp*) *Wus* Cultivars

Appendix 6 Breadfruit (*Artocarpus altilis*, *Artocarpus mariannensis*) *Moai* Cultivars

Appendix 7 Common Taro (*Colocasia esculenta*) *Jawa* Cultivars

Appendix 8 Coconut (*Cocos nucifera*) *Nih* Cultivars

Appendix 9 Traditional Recipes for Selected Food Crops (still for checking)

Appendix 10 Photographs Taken

Appendix 11 Sample Descriptions

Appendix 12 Preliminary laboratory results: carotenoid contents of Mokilese foods

Background

This visit was part of the project titled Documentation and Conservation of Traditional Staple Food Crops of Pohnpei, initiated February 2003, with support by the Pacific Agricultural Plant Genetic Resources Network (PAPGREN), which is coordinated by the Secretariat of the Pacific Community (SPC) and International Plant Genetic Resource Institute (IPGRI), and funded by ACIAR and NZAID. It followed the 1st and 2nd Pohnpei Banana and Giant Swamp Taro Workshops, August 20, and October 23, 2003, at which the names of Pohnpei banana and giant swamp taro varieties were documented.

Mwoakilloa, which has also been called Mokil, is an atoll composed of three islands. It is located east of Pohnpei and is connected by one or two weekly 40-minute flights and by the local ship, which goes around once monthly. Mwoakilloa has its own distinct culture and language. About 200 people live on the island, and the Mokilese community totals around 3000 in total, most living in Pohnpei and including many highly educated citizens of the Federated States of Micronesia (FSM). The second FSM president was from Mwoakilloa and half of the medical doctors of the Pohnpei Health Department are Mokilese. The sources of income on Mwoakilloa are copra and dried fish.

Giant swamp taro, *Cyrtosperma chamissonis*, is a traditional staple food crop, along with breadfruit, banana, and coconut. It is resistant to the saline soils of atoll conditions and is available year-round (i.e., it is not a seasonal crop). It can be eaten when breadfruit is not in season and it also withstands strong winds and hurricanes, thus providing food security. Great care is taken to produce this food crop, and there are annual competitions for the largest and best *Cyrtosperma* corms. Pandanus is also an important food for Mwoakilloa and is eaten raw as a snack as well as cooked and prepared in several recipes. There are a number of varieties of both giant swamp taro and pandanus. Thus, it was agreed that a primary aim of the visit would be to focus on the documentation of these two food crops and to collect samples for nutritional analysis and to document other food crops if possible.

As these foods have such great health benefits, the visit was coordinated with the Pohnpei Department of Health. Dr. Eliaser Johnson, Medical Officer for the Public Health Section, based in Pohnpei, is the Vitamin A Coordinator for Pohnpei State and looks after public health work in the outer atoll islands. He is also Mokilese and speaks the language. Ms. Yumiko Paul, Nutrition Educator from the Pohnpei Department of Health, also speaks Mokilese and had been invited to return to Mwoakilloa to give cooking demonstrations to increase the variety of recipes among the community there. Dr. Johnson, Ms. Paul, and Dr. Englberger made up the team for the Mwoakilloa visit.

Aims

- To train community members in describing the nutritional qualities of the local food crops
- To document names, synonyms and characteristics of giant swamp taro, pandanus cultivars

- To collect samples of different varieties of giant swamp taro and pandanus
- To document names, synonym and characteristics of other food crops if possible
- To raise awareness of the need for promotion of local food crops
- To train community members in the preparation of new recipes of vitamin A-rich foods and in healthy cooking methods
- To collect and document traditional recipes involving the primary food crops
- To coordinate with the Health Assistants on the island and bring needed medicine

Preparations

Approval for Dr. Johnson and Ms. Paul to make the trip to Mwoakilloa was first obtained from the Chief of Public Health. Dr. Johnson carried out preparatory work for the visit by making radio calls to Mwoakilloa and to the Health Assistants, Mr. Kehn Albert and Mr. Marciano Edmund. They then made all the preparatory arrangements for announcing and publicizing the community training meeting, which was arranged for the evening of 21 November. Dr. Johnson made arrangements for Ms. Paul and Dr. Englberger to lodge at the Health Dispensary, which has a kitchen and toilet. His lodging was provided by family members on Mwoakilloa. The Health Assistants provided transport by boat from the airport to the town center.

Dr. Englberger made photocopies of the Mwoakilloa food crops and variety names, as documented in the Mokilese dictionary (Harrison and Albert, 1977) to provide a basis for the documentation. A formatted table documenting the major characteristics and identification of taro and pandanus cultivars was prepared. For taro, a focus was on the name, color of the raw corm, color of the stem of the plant, if the stem has thorns, and any other comments. For pandanus, a focus was on color of the key, size of the key, if the variety is consumed raw, cooked or both ways, and any other comments.

Ms. Paul prepared a collection of different vitamin A-rich bananas for a food display including *Taiwang*, *Karat*, *Peleu*, and *Akadahn* bananas. She developed a banana bread recipe, which uses no eggs (which are not easily available on Mwoakilloa) and very little sugar and salt and prepared six *Taiwang* and *Karat* cakes the night before the trip. She also prepared three *Taiwang* pies, using home-made crusts, and brought them so that they could be tasted by the participants at the group meeting. She brought the ingredients for a chicken soup with vegetables (including local *Kang Kong* leaves and imported onion and carrots) and prepared that after arrival on the island.

Equipment and materials prepared and taken to Mwoakilloa included:

- Formatted sample and documentation lists
- Tape for labeling foods and bags for samples
- Black permanent marker for labeling and photographic work
- Roche Color Fan for measuring color of edible corms and keys
- Digital camera, scales, measuring tape (to measure size of keys, corms)
- Pohnpei Food Crops Photo Collection (over 50 photos) for identification purposes
- Pohnpei Vitamin A-rich Foods (laminated poster set) for teaching purposes

- Foods for tasting: *Taiwang* and *Karat* Cake and Pie, ingredients for Chicken Soup with Vegetables, Styrofoam cups for serving the soup, knife, cooking pot

Community Meeting

There was great support and interest shown by the Health Assistants and many community members in the visit and topic of the documentation and promotion of the local food crops. Despite the storm and high winds on the day of the arrival and group meeting, over 50 people participated (Appendix 1), 27 men and 24 women.

Dr. Johnson opened the meeting and introduced Dr. Lois Englberger, who made a short presentation on the laminated Pohnpei Vitamin A-rich Food Posters. These were taped for display on the walls and presented along with the food display. Dr. Johnson explained in detail the background of the analysis of the local foods and their high nutritional values and the aims of the visit.

Ms. Paul explained how to prepare the recipes (Appendix 2). Samples were shared with all for tasting. Participants were very enthusiastic about the recipes and how good the food tasted and requested that Ms. Paul come on each health visit to the island.

The remainder of the meeting was devoted to documenting the names and characteristics of giant swamp taro varieties. A poster sheet was filled in and local crop experts provided the information on names, corm color, stem color, thorns, and other characteristics. Some information was also gathered on the other food crops.

At the close of the meeting, various other information was documented, as follows:

- Giant swamp taro is highly valued, but consumption is infrequent.
- Four families have *Karat* banana; planting material was provided in the 1999 campaign promoting *Karat* banana.
- The carotenoid-rich *Taiwang* banana used to be grown on the main island of Mwoakilloa but elders believed that it had germs due to its high sugar content and discouraged its cultivation. One man still grows *Taiwang*, but it is on the uninhabited island of Mwoakilloa; he does not harvest it for his family or consume it. People indicated that they would now like to start growing it again.
- There are no *Akadahn*, *Utin Iap*, or *Mangat* bananas on the island. People would be thankful to the Agriculture Department if planting material could be provided, also *Ipali*, as the man who has it will not share with the others.
- *Mei pa*, the seeded breadfruit found high in provitamin A content, is grown but is not much valued. The preserved breadfruit and pandanus, *Sehnikun*, was prepared before but no longer.
- Pandanus was previously better cared for, taking care to tie a knife to a stick for harvesting bunches; now an entire branch may be cut off, damaging the tree.
- People do not associate pandanus with health benefits. They ate it more in the past and valued it more because they needed it to survive, whereas now there are other alternatives, such as imported rice, flour, and sugar.

- The old Mokilese pandanus varieties like *Doapwoahdin* are dying out as people prefer the newly introduced Marshallese varieties, and due to neglect.

Other Data Collection

Several informal focus group meetings and many key informant interviews were held from the first day and throughout the visit in order to document names and the distinguishing characteristics of the main crops. Names were collected for 19 giant swamp taro, 21 pandanus, 13 banana, 10 breadfruit, 11 common taro, and five coconut varieties that presently are growing on Mwoakilloa (Appendices 3-8). Traditional recipes were also collected (Appendix 9). Over 50 photographs were taken, to document characteristics of the foods (Appendix 10) and to document cooking methods.

On Saturday, Dr. Johnson, Dr. Englberger, Ms. Paul, one local food expert, Nelson Albert, and the Health Assistants Mr. Kehn Alpert and Mr. Marciano Edmund visited the taro patch for observations, planning the sample collection, and taking the first samples. The water ditches and careful cultivation methods were observed and photographed. To harvest a corm requires walking in deep mud (up to the thighs and waist) and a knife is needed for cutting the roots of the corm. Soil is built up and compacted two to three feet high around the corms and lower stems for the taro that are being prepared for the annual competitions. They become very large by using this cultivation method. Both men and women carry out the taro cultivation work. The youth are less knowledgeable.

Small plants of eight varieties were harvested and photographed. Four corms were harvested. It was later decided to collect the remaining samples on the morning of the return flight. At that time, sample corms were harvested, weighed, measured, and the bottom part was cut off for the sample. The remainder was left with the respective owners. The raw unpeeled sample corms were labeled and wrapped in plastic for the flight back to Pohnpei for sample preparation there. Data on the size and color of the edible flesh of the corms harvested for samples were taken (Appendix 11). A plan was then made for the sample collection. Efforts were made to get three corms of each variety: the bottom part would be then cut off for the sample, and the remainder left for the family to consume. The raw unpeeled sample corms would be taken back to Pohnpei for the sample preparation there.

Informants reported that *Mokmok*, arrowroot, is dying out, as people are now purchasing imported packaged starch. Efforts were not successful to get samples of the fruit *Apus*, *Crataeva speciosa*. It is noted that it is likely that many of the cultivars, particularly banana, are not necessarily new or different to those listed for Pohnpei.

Further Work and Recommendations

- Prepare the collected food samples and analyze them for nutritional quality.
- Hold a further meeting in the coming year to present the analysis results, and further document the food crops, including *Apus*.
- Provide planting material for certain banana varieties not available on the island.

- Continue with recipe development and carry out a cooking demonstration of selected recipes on the next visit (the Mwoakilloa community also asked for this).

Costs (US\$)

Flight from Pohnpei to Mwoakilloa return (\$120 x 3 facilitators)	420
Per diem costs for facilitators (\$30 x 3 facilitators)	90
Overweight (in excess of 20 pounds per person)	32
Food demonstration, cooking equipment, and display	40
Sample purchase	19
Total	601

Summary Provided to SPC for distribution to PAPGREN members

A visit to the outer Pohnpei atoll island of Mwoakilloa, Federated States of Micronesia (FSM) was carried out November 21-24, 2003. This was a part of the project supported by PAPGREN to document and promote the traditional food crops of Pohnpei. The activity was led by Dr. Lois Englberger, affiliated with the Pohnpei Agriculture Division of the Department of Economic Affairs, Dr. Eliaser Johnson and Ms. Yumiko Paul from the Pohnpei Department of Health, and Mr. Kehn Albert and Mr. Marciano Edmund, who are the Health Assistants for the Mokilese community. Due to the importance of giant swamp taro (*Cyrtosperma chamissonis*) and pandanus (*Pandanus tectorius*) for this atoll island, the work focused on those two crops, but also gathered data on other food crops as well. The team traveled to Mwoakilloa by the regular 40-minute weekly flight, and a community meeting on the same day was held and attended by over 50 Mokilese men and women. Dr. Johnson discussed the health and nutritional values of traditional FSM foods and Ms. Paul presented vitamin A-rich recipes and food samples, including Chicken Soup made with *Kang Kong* Leaves and the *Taiwang* and *Karat* Banana Bread and Pies, and also a display of four different varieties of vitamin A-rich bananas (*Taiwang*, *Karat*, *Akadahn*, and *Peleu*). The participants showed great interest. Food beliefs were discussed, one man explaining that they used to grow *Taiwang* on the main island of Mwoakilloa but that elders had said that it had germs and discouraged its production and consumption. This belief that *Taiwang* has germs was said to have originated because that banana is very sweet, but the people now indicated that they would like to grow and eat this banana, based on the new information.

Composite samples for nutritional analysis for eight taro and six pandanus varieties were collected, weighed, and measured for color, length and girth. Informal focus group discussions and key informant interviews were conducted to obtain information on the local food crops. The names were documented for 19 giant swamp taro, 21 edible pandanus, 13 banana, 10 breadfruit, 11 common taro, and five coconut varieties that are presently growing on the atoll. Due to the great interest shown in Mwoakilloa in this project, plans were made to return to the island once the analyses have been completed and to present the results, as well as to further document the variety names and

characteristics, to bring the requested planting material for vitamin A-rich banana, and to show further new recipes for the local foods.

Reference

Harrison, S. P. and Albert S. 1977. Mokilese-English Dictionary. PALI Language Texts: Micronesia. Honolulu, University of Hawaii Press.

Acknowledgements

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Appendix 1

Participants in the Mwoakilloa Community Meeting on Documentation and Promotion of Local Food Crops, Mwoakilloa Municipal Office, 21 November, 2003, 5:00 pm to 8:30 pm

Names of Participants	Gender	Names of Participants	Gender
1. Charley John	Male	31. Miuleen Obed	Female
2. Johper Jim	Male	32. Barbara Lipai	Female
3. Don Johnson	Male	33. Nelson Albert	Male
4. Marciano Edmund	Male	34. Clyde Ben	Male
5. Wayne Obed	Male	35. Lincoln Lebehn	Male
6. Romeo Joel	Male	36. Elieu Peter	Male
7. Jera Ben	Female	37. Onio Edmund	Male
8. Mary Ann Joel	Female	38. Ruly Neth	Male
9. Victoria S. Johnson	Female	39. Qlynn Sepety	Female
10. Lihda Obed	Female	40. Edward Dannis	Male
11. Noreen Edmun	Female	41. Deetor Lebehn	Male
12. Justino Olm	Male	42. Rebecca lebehn	Female
13. Daniella Ben	Female	43. Emiko Johnson	Female
14. Mineko Tine	Female	44. Miuleen Obed	Female
15. Kihna Lipai	Female	45. Essy Obed	Female
16. Danson Obed	Male	46. Yukie Henry	Male
17. Taylor David	Male	47. Freeland Obed	Male
18. Richard Ben	Male	48. Karlise Ben	Female
19. Kehn Albert	Male	49. Merly David	Female
20. Rocky Ben	Male	50. Glorihna Dannis	Female
21. Spencer Obed	Male	51. Marlihna Lebehn	Female
22. Davy David	Male		
23. Biuleen Obed	Female	(in addition 10-15 children)	
24. Moluima Luhda	Female		
25. Barabara Lipai	Female		
26. Aidel Obed	Male		
27. Kalio Lebehn	Male		
28. Molrina Luhda	Female		
29. Ronald Albert	Male		
30. Mugayda Harry	Female		
Facilitators			
1. Dr. Eliaser Johnson	Male		
2. Ms. Yumiko Paul	Female		
3. Dr. Lois Englberger	Female		

Appendix 2 New Recipes Presented by Ms. Yumiko Paul to the Mokilese Community

Taiwang (or Karat) Bread

1 $\frac{3}{4}$ cup flour
1 $\frac{1}{2}$ teaspoon baking powder
 $\frac{1}{4}$ teaspoon salt
 $\frac{1}{4}$ cup sugar
 $\frac{1}{2}$ cup shortening
 $\frac{1}{4}$ cup oil
1 cup ripe banana, either *Taiwang* or *Karat*
1 tablespoon lime juice

Directions:

1. Mix flour, baking powder, and salt.
2. Mix shortening, oil, and sugar together, and add dry ingredients.
3. Mash banana, and add lime juice, which helps the banana to keep its color.
4. Add banana to the other ingredients, mix well, and put in a greased baking tin.
5. Bake for about one hour. The locally improvised oven made from a biscuit tin may also be used, as well as the local charcoal ovens used on Mwoakilloa.

Taiwang Banana Pie

4 cups sliced *Taiwang* banana, ripe but firm
 $\frac{1}{2}$ cup pineapple juice or lime juice
 $\frac{1}{4}$ cup sugar
1 teaspoon cinnamon
1 tablespoon butter or margarine
pastry for 2 crusts (see below)

Directions:

1. Soak sliced banana in pineapple juice for 20-30 minutes.
2. Drain, saving the juice.
3. Place the bananas in a pastry-lined pie plate.
4. Mix sugar and cinnamon and add.
5. Add 2 tablespoons of the pineapple juice that was saved (the rest may be drunk).
6. Dot with butter or margarine and cover with crust.
7. Bake at 400 degrees Fahrenheit or until crust is golden brown.

Pie Crust

1 $\frac{1}{2}$ cup sifted flour
 $\frac{1}{2}$ teaspoon salt
 $\frac{1}{2}$ cup shortening
3 tablespoons cold water

Chicken Soup with Carrots (or Pumpkin) and Kang Kong Leaves

4 chicken thighs

1 package of carrots (home-grown pumpkin can also be used)

1 bundle of Kang Kong leaves

½ onion

1 can tomatoes with chili, optional

Directions:

1. Remove skin from chicken.
2. Use a part of one skin to stir-fry the onion.
3. Throw away the skin and add the chicken and stir.
4. Add ¼ cup of water and cover to cook.
5. Cook 10-15 minutes.
6. Add the carrots and cook 10 minutes longer.
7. Add the Kang Kong and cook 5 minutes longer.

This recipe requires no added salt or soy sauce.

Appendix 3 Giant Swamp Taro (*Cyrtosperma chamissonis*) *Mwehng* Cultivars

Cultivar-Variety	Corn Color	Stem Description	Thorns	Other comments
1. <i>Jehm</i>	Very yellow	Green with black dots	no	Most sticky, good to eat just boiled and um; a Pingelapese taro.
2. <i>Jeria</i>	Yellow	Green	no	Corn has one bottom, but 2-3 stems.
3. <i>Jikohki</i>	White/yellow	Dark green, slender, long	no	Name means airplane, maybe fast-growing. Big corn, good for <i>matlahik</i> .
4. <i>Jiminden</i>	Yellow	?	?	Rare, from Sapwafiq; may be gone, they would like to get.
5. <i>Joanpwongwenu #1</i>	Very yellow	Red	no	Grows fast, good for <i>rodimadok</i> . There are two types.
6. <i>Joanpwongwenu #2</i>	Light yellow	Red	no	Grows fast, good for <i>rodimadok</i> .
7. <i>Nihn-Abraham</i>	White	Light green	yes	Thorns are scattered, develop only when plant is older.
8. <i>Nihn-Dihjon</i>	Light yellow	Green-reddish, slender	no	
9. <i>Nihn-Dannis</i>	Light yellow	Green	no	
10. <i>Nihn-Eneri</i>	Yellow	?	?	
11. <i>Nihn-Jaimon</i>	White/yellow	Red	no	Stringy texture, good for <i>pliohlo</i> and <i>rodimadok</i> recipes.
12. <i>Nihn-Limwei</i>	Light yellow	Green	no	Name refers to a woman, all rest of <i>Nihn</i> ones refer to a man's name.
13. <i>Nihn-Ringlen</i>	Light yellow	Red	yes-lots	Lots of thorns but less than <i>Nihn-Simion</i> . Very sticky.
14. <i>Nihn-Simion</i>	Light yellow	Red	yes-lots	
15. <i>Nihn-Toahmw</i>	Yellow	Light green	yes	Thorns are scattered.
16. <i>Saleng</i>	Very yellow	Green, black zigzag stripes	no	Small growth called an ear on underside of the leaf. Very sticky.
17. <i>Wikale</i>	Yellow	Red with black spots	yes	Developed by seed from <i>Joanpwongwenu</i> (6-moon). Fast growing.
18. <i>Nihn-Peres</i>	-	-	-	Description still to obtain.
19. <i>Wahrau</i>	-	-	-	Description still to obtain.
<i>Dor'tkeephim</i>	-	-	-	They heard of it, but it may be gone. Variety from Sapwafiq.
<i>Tekaroi</i>	-	-	-	They used to have, but no longer.
<i>Pahmedel</i>	-	-	-	They used to have, but no longer.

Terms

Bulbul

Stickiness of cooked taro, which is highly valued for eating quality.

Wehmwehng

All varieties growing from the seed, refers to taro such as *Nihn-Abraham*, *Nihn-Dihjon*, *Nihn-Dannis* etc..

Appendix 4 Pandanus (*Pandanus tectorius*) Kipar Cultivars

Cultivar-Variety	Key size	Key color	Use		Comments
			Raw/Cook		
1. <i>Juaipwahpw</i>	medium	light orange	both		Two kinds, one is crunchy (keys fall from bunch) and one is not crunchy.
2. <i>Jipwehrik</i>	big	very orange	both		Most all are tall trees. Fruit is good for <i>maiahlik</i> and <i>beru</i> , good for baby food.
3. <i>Doapwoahdin</i>	big	very orange	both		Good for <i>maiahlik</i> and <i>beru</i> , good for baby food, much <i>mokwan</i> .
4. <i>Kipar in Masal</i>					Variety from the Marshalls.
5. <i>Kipar in Pid</i>					Variety from Kiribati.
6. <i>Luarme</i>	medium	very orange	both		Two kinds, one with keys that fall when ripe and one kind that breaks. Very sweet.
7. <i>Mehkikil</i>	small	orange	raw		Rare, very crunchy, you can eat almost all of it.
8. <i>Mehusik</i>					Still to describe.
9. <i>Nehkkehndak</i>	small	light orange	both		Almost like <i>Mehkikil</i> . Rare, medium crunchy, a little itchy.
10. <i>Insohl</i>	big	very orange	both		Not seen for a long time, may be gone, not very sweet. Keys look like <i>Deipw</i> .
11. <i>Deipw</i>	medium	light orange	raw		Has a seed, eaten raw, extractable without knife. May be gone, people do not value.
12. <i>Lehkmwahn</i>					Variety from the Marshalls.
13. <i>Moakoskos</i>	small	light orange	both		Rare, maybe gone, not so sweet and not so popular.
14. <i>Johnmonoia</i>	big	yellow-orange	raw		Harvest only 1x in a year or 1x in two years. Takes long time to grow, is very sweet.
15. <i>Mahngoron</i>	medium	very orange	both		Same as <i>Doapwoahdin</i> , but bigger. Lots of <i>mokwan</i> .
16. <i>Jorum</i>	big	med. orange	both		Introduced after World War 2, good for <i>maiahlik</i> , babies, flat protrusions.
17. <i>Wetetet</i>	small	light orange	both		Introduced after World War w, some man brought, sweet, not much <i>mokwan</i> .
18. <i>Aida</i>	small	light orange	raw		Very sweet, old one, real Mokliese. Rare, you do not often see.
19. <i>Mwajak</i>	big	light orange	both		Very sweet, crunchy, good for handicraft. From Jaluit, also called <i>Kipar in Jelwij</i> .
20. <i>Oarwehnin pehn pajjo</i>	small	light orange	both		A type of <i>Oarwehn</i> pandanus that is edible.
21. <i>En Kehlen</i>	big	light orange	both		Description still to obtain.
<i>Pwenpweh, Jukpej</i>					Two varieties still to be described, not sure if still growing on <i>Mwoakilloa</i> .
<i>Oarwehn</i>	small	light orange	-		3-5 kinds, they grow by seed, considered wild, inedible, very itchy. Good for building.
<i>Ummahng</i>	no fruit	-	-		

Moang in kipar

Key that is to be eaten (*pej* is the key that is already eaten or is to be thrown away).

Nigid

Chew, how pandanus is consumed (not *kang*, eaten). *Sipwalpwal* refers to the highly valued crunchy characteristic.

Kipar, Mokwan

Kipar refers to the tree and bunch. *Mokwan* is the edible pulp from the key. *Waikong* is the utensil for scraping out the *Mokwan*.

Appendix 5 Banana (*Musa sp*) *Wus* Cultivars

Cultivar-Variety	Pohnpei name	Characteristics
1. <i>Daiwang</i>	<i>Taiwang</i>	Only one person grows it (on Urik Island), it is not harvested or eaten
2. <i>Inahjio</i>	<i>Inasio Pehses</i>	Most common banana on Mwoakilloa, has thin light-green skin
3. <i>Ihpali</i>	<i>Ihpali</i>	One person has it, but he will not share
4. <i>Johrum</i>	<i>Inasio Poh Rotoro</i>	An <i>Inasio</i> type having thicker blackish-colored skin
5. <i>Kalpohnia</i>	<i>UtinMenihle</i>	Same as Pohnpei variety
6. <i>Poupoulap</i>	<i>Utin Ruk</i>	Same as Pohnpei variety
7. <i>Wus Amerkocair</i>	?	Documented in the Mokilese dictionary as having S America origins
8. <i>Wus Karas</i>	<i>Karat</i>	Four families were reported to have this banana, more want it
9. <i>Wus in Kerenis</i>	<i>UtinKerenis</i>	A number of families have the variety
10. <i>Wus in Kuam</i>	<i>UtinGuam</i>	Same as Pohnpei variety
11. <i>Wus Luhda</i>	?	Very yellow flesh, is similar to <i>Ihpali</i>
12. <i>Wus in Pihji</i>	<i>Utin Pihsi</i>	Fairly common in Mwoakilloa, same as Pohnpei variety
13. <i>Wus in Prejil</i>	<i>Praisihl</i>	It only grows on the uninhabited island Urik, same as Pohnpei variety.
<i>Wus Akadahn</i>	<i>Akadahn</i>	It was previously grown, but died out
<i>Wus in Yap</i>	<i>Utin lap</i>	It was previously grown, but died out

Appendix 6 Breadfruit (*Artocarpus altilis* and *Artocarpus marianensis*) *Moai* Cultivars

Cultivar-Variety	Pohnpei Name	Seeded or Unseeded	Characteristics
1. <i>Moai Pa</i>	<i>Mei Kole</i>	Seeded	Very yellow flesh, is eaten raw and cooked, not highly valued
2. <i>Moai Si</i>	?	Seeded	May no longer be grown; or may be on Urik (uninhabited island)
3. <i>Moai Soal</i>	?	Seeded	Skin is blacker, inside is yellow
4. <i>Moai Kalak</i>	<i>Mei Kalak</i>	Unseeded	Smooth-skinned
5. <i>Moai Samoa</i>	?	Unseeded	Smooth-skinned
6. <i>Moai Soahid</i>	?	Unseeded	Smooth-skinned
7. <i>Moai Upw</i>	<i>Mei Uhpw</i>	Unseeded	Smooth-skinned
8. <i>Moai in Pahdak</i>	?	Unseeded	Type of <i>Moai Joapwoahroak</i> (rough-skinned)
9. <i>Moai Ngeljoau</i>	?	Unseeded	Type of <i>Moai Joapwoahroak</i> (rough-skinned)
10. <i>Moai Uhrek</i>	?	Unseeded	Type of <i>Moai Joapwoahroak</i> (rough-skinned)

Appendix 7 Common Taro (*Colocasia esculenta*) Jawa Cultivars

Cultivar-Variety	Characteristics
1. Jawahn Anser	Variety name refers to a person's name
2. Jawa Boadi	<i>Boadi</i> and <i>Soal</i> both have black stem. <i>Soal</i> has a larger stem
3. Jawa Dawa	Used to grow on Mwoakilloa, but may now be gone
4. Jawahn Jeipan	
5. Jawa Kajang	
6. Jawa Mwang	Very large corm
7. Jawahn Pihji	Variety coming from Fiji
8. Jawahn Palau	Variety coming from Palau
9. Jawa Soal	Black stem
10. Jawa Wasa	Red stem
11. Jawahn Yap	Variety coming from Yap

Appendix 8 Coconut (*Cocos nucifera*) Nih Cultivars

Cultivar-Variety	Characteristics
1. Atoi	The husk can be eaten, either raw or cooked. When cooked, it may be eaten with copra.
2. Nihnpwinso #1	Dwarf tree brought from Pohnpei, fast-growing, may harvest after 5 years. Green-skinned coconut.
3. Nihnpwinso #2	Dwarf tree brought from Pohnpei, fast-growing, may harvest after 5 years. Orange-skinned coconut.
4. Nih regular	Tall tree, several kinds (green and orange-skinned). Best for drinking coconut and for copra.
5. Nihsik	Tall tree, the coconut is smaller than the regular one, sweetest of all coconuts.

Terms for coconut stages

<i>Kurup</i>	1st stage. Very small amount of liquid.
<i>Upw</i>	2nd stage. Some liquid but little flesh
<i>Pen pwulopwul</i>	3rd stage. Some liquid, some flesh, but still the shell is very soft.
<i>Pen mere</i>	4th stage. Drinking coconut.
<i>Pen mwangas</i>	5th stage. Flesh is not quite hard, not yet copra.
<i>Oaring</i>	6th stage. Flesh is hard, this is the copra stage.
<i>Par</i>	7th stage. Sprouted coconut.

Appendix 9 Traditional Recipes for Selected Food Crops

Note: These should be considered as in draft form. It is planned to later go back to check these recipe instructions with the Mokilese Community to ensure accuracy.

Pihlolo Mweng

1. Grate raw giant swamp taro.
2. Add starch.
3. Add coconut cream and mix well.
4. Cook sugar until caramelized and add water and pour into baking tin.
5. Make oval-shaped balls about a cup in amount and place in baking tin.
6. Bake in charcoal oven about an hour

Ken's *Pihlolo*

1. Grate raw taro.
2. Pound ripe banana.
3. Boil pandanus and squeeze out pulp (*mokwan*).
4. Add coconut cream.
5. Add sugar or molasses.
6. Mix well and put into tin.
7. Bake for about an hour.

Maitahlik

1. Boil pandanus keys.
2. Squeeze out juice (*mokwan*).
3. Mix with coconut cream.
4. Put in a little sugar.
5. Grate giant swamp taro.
6. Make balls.
7. Add the pandanus and coconut cream mixture and put in baking tin.
8. Bake.

Beru

1. Boil pandanus keys.
2. Squeeze out the pulp (*mokwan*).
3. Mix with coconut cream.
4. Put in a little sugar.
5. Mix all together.
6. Put in pan and bake for about an hour.

Rodima

1. Grate raw taro.
2. Add coconut juice, or water and sugar.
3. Put into baking pan.
4. Bake for an hour.

Rodimadok

1. Grate taro.
2. Put in parcels (taro leaf) and put in oven and bake.
3. Take baked taro from parcel, put in basin, and break apart.
4. Add coconut juice, or water and sugar, mix, and it is done.

Rodima Wus

1. Grind taro.
2. Pound ripe banana.
3. Add coconut juice or water and sugar.
4. Put in baking tin and bake for about an hour.

Pihlolo Sawa

1. Cook common taro, *Colocasia esculenta*. (It is too itchy to grind raw)
2. Pound it and break it apart.
3. Add coconut cream.
4. Cook sugar and add.
5. Put in baking tins and bake.

Rugol

1. Grate coconut.
2. Add flour, sugar, and water making a batter.
3. Prepare banana parcels, soften banana leaves, and de-rib leaves.
4. Put about a cup of batter on a banana leaf and wrap up.
5. Place in the charcoal oven and bake for about an hour.

Appendix 10 Photographs Taken

Arrival on island	Photo on beach of team, photo in boat to go to town center
Community meeting	Photos of Dr. Johnson presenting talk to the community Photo of Ms. Paul presenting food display Photo of man looking at the Pohnpei Food Cultivars album Photo of wall display of Pohnpei Vitamin A-rich Foods
Giant swamp taro	Photos of local expert, Nelson Albert, in the taro patch Photos of 8 varieties of young taro plants, showing differences Photos of stems of mature taro corms and colorations Photo of rows of taro and irrigation ditch Photo of flower of giant swamp taro Photo of hand taro grater with Kehn Albert Photo of child eating cooked taro piece Photo of man cutting peeled taro into pieces Photo of woman grating taro with grater Photo of family preparing <i>Pilolo Mweng</i> with 6-moon taro Photo of team preparing taro corm samples Photo of <i>Wicklale</i> cut taro corm
Pandanus	Photo of keys of <i>Kipar en Jelwij</i> , <i>Mwajak en Kehlen</i> , <i>Jorum</i> , <i>Mehkilkil</i> , <i>Kipar en Majal</i> , and <i>Doapwatin</i> comparing colors Photo of keys of <i>Mwajak</i> Photo of children eating pandanus keys Photo of the <i>Waikong</i> utensil for scraping pulp from the keys
Banana	Photo of <i>Inajio</i> bunch and photo of woman pounding <i>Wus en Pihji</i>
Coconut	Photo of low-bearing dwarf coconut with woman
Cooking	Photos showing the preparation of fire, de-ribbing banana leaves, <i>Rugol</i> batter, putting <i>Rugol</i> mixture into banana packets, and putting banana packets into the charcoal oven
Group photo	Group photo of team assisting in the sample collection including Dr. Eliaser Johnson, Yumiko Paul, Kehn Albert, Marciano Edmund, Nelson Albert

Appendix 11 Sample Descriptions

Giant swamp taro: Details on Whole Corms

Cultivar name	Corm Weight pounds	Length cm	Girth cm	Corm Edible Portion Roche Fan Color Measure
1. <i>Nihn-Jaimon</i> (2 corms)	8, 14.7	29, 29.5	47, 65	1
2. <i>Jikohki</i> (1 corm)	4.5	22	45	<1
3. <i>Six-moon white</i> (1 corm)	7.5	25	65	1
4. <i>Six-moon red</i> (1 corm)	14.75	35	58	1 in middle 4-5 in outer part
5. <i>Jehm</i> (3 corms)	8.5, 11.25, 11	20, 23, 18	47, 53, 55	1
6. <i>Wahrau</i> (1 corm)	8.5	23	50	1
7. <i>Wiklale</i> (1 corm)	9	29	48	<1
8. <i>Nihn peres</i> (1 corm)	6	19	48.5	1

Pandanus: Details on whole keys (edible and inedible portions)

Cultivar name	Key Weight grams	Length cm	Girth cm	Key Edible Portion Roche Fan Color Measure
1. <i>Mehkilkil</i> (7 keys)	Range 44-82 Mean 64	7	Range 12-15 Mean 14	5 inner 50% 9 outer + streaks 50%
2. <i>Doapwoahdin</i> (6 keys)	Range 130-212 Mean 156	11	Range 17-21 Mean 18	3 inner 35% 9 + 11 middle 30% 14 outer 25% 11 outer 10%
3. <i>Mwajak</i> (6 keys)	Range 134-158 Mean 143	9	Range 19-20 Mean 20	9 inner 45% 11 outer 45% 14 outer streaks 10%
4. <i>Kipar en Majal</i> (7 keys)	Range 126-202 Mean 165	10	Range 17-21 Mean 20	8 inner 90% 11 outer 10%
5. <i>Jorum</i> (7 keys)	Range 74-112 Mean 89	8	Range 15-18 Mean 16	9 inner 50% 11 outer + streaks 50%
6. <i>En Kehlen</i> (6 keys)	Range 94-126 Mean 111	9	Range 16-16.5 Mean 16.5	9 inner 90% 14 outer streaks 10%

Pandanus Taste Description

Cultivar name	Sweetness	Flavor/Aroma	Texture/Pulp	Overall Comment
1. <i>Mehkilkil</i>	Very sweet	Very flavorful.	Crunchy. Less fibre, you can almost eat it.	Easy to extract, not much fiber, good flavor, and favorite of all.
2. <i>Doapwoahdin</i>	Very sweet	Very strong nice flavor. Smells like fresh paint.	Very pulpy.	Would be nice for using pulp for making a fruit salad dressing.
3. <i>Mwajak</i>	Very sweet	Most flavorful.	More pulp.	Easy to extract juice and pulp.
4. <i>Kipar en Majal</i>	Very sweet	Citrusy and fanta-like.	Strings not too tough.	Easy to eat, top half much more citrusy.
5. <i>Jorum</i>	Less sweet	Not as flavorful.	More strings.	Slightly itchy.
6. <i>En Kehlen</i>	Very sweet	Pear-like flavor.	Pear-like consistency.	Easy to extract.

Description of methodology: The taste description and documentation was carried out in Pohnpei as a panel of two persons, Dr. Englberger and Ms. Catherine Sundvall, thanks are extended for her assistance. It is noted that Ms. Sundvall had had no prior experience of tasting this food but she liked the taste greatly and was enthusiastic about the fruit. The keys were very ripe and had been kept in the refrigerator for three days after harvesting. The inedible ends of the keys cut from the part taken for the samples were used for the tasting exercise as there is always some pulp remaining in that end. For some cultivars, the keys were very large for the samples (amount which was kept at total weight 150-250 grams due to the logistics of storage and transport to the laboratory). Thus the large keys were cut in halves, and half of each key was used for the sample, leaving the other half for the tasting panel, and also a few replicate samples for possible analysis at a second laboratory.

Results and recommendations: Each cultivar had a distinct taste. Further work on taste description and documentation of the different cultivars, including comments from a wider range of persons, including Mokilese and other Micronesians would be useful.

Table 1 Carotenoid content of selected cultivars of ripe pandanus *Pandanus tectorius* ($\mu\text{g}/100\text{g}$ edible portion, means of duplicate analyses)

Cultivar Name ^a	Raw or cooked ^b	N ^c	Color of edible flesh ^d	β -carotene	α -carotene	β -cryptoxanthin	Lutein	Zeaxanthin	Total carotenoids ^e	% Water
Kapingamararangi										
<i>Dolongahai</i>	Raw	10	Orange. R5-30%, R9-60% R14-10%	300	50	20	130	220	2510	80
<i>Dalinga</i>	Raw	6	Orange. R8-90%, R14-10%	180	10	10	40	100	1920	79
Mokil										
<i>Kipar en Majal</i>	Raw	7	Orange. R8-90%, R11-10%	280	10	20	20	110	1470	79
<i>Mwajak</i>	Raw	6	Orange. R9-45%, R11-45% R14-10%	250	10	10	20	160	1670	80
<i>Jorum</i>	Raw	6	Orange. R9-90%, R11-50%	240	40	<10	180	160	1500	80
<i>Mehikikil</i>	Raw	7	Orange. R5-50%, R9-50%	190	30	<10	90	LOD	1510	82
<i>Doapwadin</i>	Raw	6	Orange. R3-35%, R9-11-30%, R14-25%, R11-10%	180	20	10	70	110	1170	78
<i>En Kehlen</i>	Raw	6	Orange. R9 inner 90%, R14 outer 10%	110	<10	20	40	20	1100	81

Note: HPLC analyses carried out by DSM Nutritional Products, Switzerland. Kapinga samples were collected July 2003.

Mokil samples were collected November 2003. Samples were delivered to the laboratory December 22, 2003; analyses carried out in March 2004. na-not available LOD: Below detection limit.

^a Names are those used on the respective islands. All samples were also analyzed for lycopene, but contained LOD.

^b Samples were prepared raw or cooked. If cooked, the keys were boiled for 30 minutes in a covered stainless steel pot.

^c Number of keys in one composite sample. Samples were composed of one bunch.

^d Color was described visually and also measured on raw or cooked keys using the Roche Color Fan, numbers ranging from 1 to 15 for increasing colorations of yellow and orange.

^e Estimated by calculating total peak areas recorded in the chromatograms (using the response factor of β -carotene); this includes xanthophyll- and cryptoxanthin-like compounds.

Table 2 Carotenoid content of selected cultivars of Micronesian giant swamp taro *Cyrtosperma chamissonis* ($\mu\text{g}/100\text{g}$ edible portion, means of duplicate analyses)

Local name ^a	Source ^b	Cooked or raw ^c	Corn age	N ^d	Color of raw flesh ^e	β -carotene	α -carotene	β -cryptoxanthin	Lutein	Zeaxanthin	Total carotenoids ^f	% Water
<i>Yubekmang</i>	Palau	Cooked	5 y	2	Yellow: R6.5	1510	450	10	260	LOD	2270	49
<i>Bolabei</i>	Palau	Cooked	4 y	1	Yellow: R 3	630	320	10	90	LOD	1090	51
<i>Adbuweg</i>	Yap	Raw	3 y	3	Yellow: R 1.5	500	100	<10	160	LOD	760	49
<i>Jelm</i>	Mokil	Cooked	na	3	Yellow: R 1	380	150	<10	80	LOD	690	55
<i>Jkohki</i>	Mokil	Cooked	na	1	Yellow: R 1	380	140	<10	30	LOD	600	58
<i>6-moon red</i>	Mokil	Cooked	na	1	Yellow: R 1	350	150	10	50	LOD	730	60
<i>Teggur</i>	Yap	Raw	5 y	3	Yellow: R 1.5	330	90	LOD	60	LOD	550	57
<i>Teggur</i>	Yap	Cooked	5 y	3	Yellow: R 1.5	180	70	<10	40	LOD	380	52
<i>6-moon white</i>	Mokil	Cooked	na	1	Yellow: R 1	310	90	<10	30	LOD	480	70
<i>Adid</i>	Yap	Raw	4 y	3	Yellow: R 1.5	310	110	<10	50	LOD	570	51
<i>Adid</i>	Yap	Cooked	4 y	3	Yellow: R 1.5	290	110	<10	80	LOD	520	59
<i>Wirkale</i>	Mokil	Cooked	na	1	Yellow: R 1	290	150	<10	30	20	490	65
<i>Nihn Peres</i>	Mokil	Cooked	na	1	Yellow: R 1	280	140	<10	90	LOD	540	62
<i>Wahrnu</i>	Mokil	Cooked	na	1	Yellow: R 1	240	100	<10	20	LOD	430	50
<i>Jaimon</i>	Mokil	Cooked	na	2	Yellow: R 1	150	40	LOD	40	LOD	300	71
<i>Gamaigul</i>	Yap	Raw	1 y	3	White: R <1	50	10	LOD	60	LOD	160	69

Note: HPLC analyses carried out by DSM Nutritional Products, Switzerland in March 2004. Yap and Palau samples were collected in August 2003; Mokil samples were collected November 2003. The samples were delivered to the laboratory December 22, 2003.

LOD: Below detection limit.

^a The local name is provided for each cultivar by country or island.

All samples also analyzed

^b Samples from Palau and Yap (main island), Federated States of Micronesia (FSM), and Mokil, FSM were collected from the

main islands.

^c Corms were peeled, cut into pieces around 3 cm thick and 10 cm in diameter according to size of corn, and boiled for 40 minutes in a covered stainless steel pot.

Some samples were frozen raw, due to difficulties of preparing boiled samples at the place of collection.

^d Number of corms in one composite sample.

^e Color of raw corm was described visually and also measured using the Roche Color Fan, numbers ranging from 1 to 15 for increasing coloration of yellow and orange.

^f Estimated by calculating total peak areas recorded in the chromatograms (using the response factor of β -carotene), it includes xanthophyll- and cryptoxanthin-like compounds.

Table 3 Carotenoid content of selected cultivars of other fruit ($\mu\text{g}/100\text{g}$ edible portion, means of duplicate analyses)

Name ^a	Source ^b	Raw or cooked ^c	Maturity	N ^d	Color of flesh ^e	β -carotene	α -carotene	β -cryptoxanthin	Lutein	Zeaxanthin	Lycopene	Total carotenoids ^f	Moisture %
<i>Apuch</i>	Chunk, FSM	Raw	Ripe	2	Orange: R6	1070	10	10	30	20	40	1460	83
<i>Te Bero</i>	Majuro, Marshall Islands	Boiled	Ripe	80	Orange: R12-skin, R6 inner flesh	160	10	20	590	1420	320	2830	86

Note: HPLC analyses carried out by the DSM Laboratory, Switzerland. The *Apuch* sample was collected in September 2003; the *Te Bero* sample was collected December 2003. Samples were delivered to the laboratory in December 2003 and analyzed in March 2004.

^a *Apuch, Crataeva speciosa; Te Bero, Ficus tinctoria.*

^b The *Apuch* sample was collected from Weno, Chuuk; the *Te Bero* sample was collected from Majuro Atoll.

^c The *Te Bero* berries were boiled for 30 minutes, as per normal cooking methods in Kiribati, where they are prepared and eaten in a few recipes.

^d Number of fruits in one composite sample.

^e Color was described visually and also measured on raw corms using the Roche Color Fan, numbers ranging from 1 to 15 for increasing colorations of yellow and orange.

^f Estimated by calculating total peak areas recorded in the chromatograms (using the response factor of β -carotene); it includes xanthophyll- and cryptoxanthin-like compounds.