A THOUSAND YEARS OF GARDENING: A HISTORY OF SUBSISTENCE ON FUTUNA[1]

Anne di Piazza and Daniel Frimigacci*

Many scholars have wondered about the subsistence mode of the early colonists of the Pacific, whom some have seen as strandloopers (Groube 1971) and others as horticulturalists (e.g. Green 1979; Kirch 1978; Hunt 1981). Today we have inventories of subsistence foods and studies of horticultural techniques for different parts of the Southwest Pacific from work like that of Yen in the Solomons (1973; 1974; 1976; Kirch and Yen 1982:25-63), of Spriggs in Vanuatu (1981; 1986) and of Kirch on Uvea and Futuna (1975; 1976; 1978). However, archaeological remains of plants, as well as of the structures associated with their cultivation, are rare, indeed exceptional, on ancient sites.

Futuna is a small island in western Polynesia situated, with its even smaller partner Alofi, roughly midway between Fiji and Samoa at about 14°S and 178°W. It has been the subject of research into questions of horticultural origins and developments. Work by Barrau (1963) on cultivated plants was followed some years later by Kirch's pioneer excavations (1975; 1976) which brought to light evidence for prehistoric horticulture. During the 1980s a CNRS-ORSTOM[2] project directed by Frimigacci and Vienne, which began with collection of oral traditions, survey of the localities associated with them and excavation of ancient sites, has in recent years come to concentrate on characterising the interrelationships over time of the people and their environment.

A FIRST CHRONOLOGY FOR FUTUNA

The chronology of Futuna can be divided into three main periods. The most ancient sites attest to an occupation on the coast. We call this period *Kele Uli*. *Ile Kele Uli* ("During the Time of the Black Earth") is how the Futunans express themselves in calling up the past (Frimigacci and Vienne 1987).

In the course of the first millennium AD people diversified their places of residence. They established villages and constructed forts in the valleys and on the plateaux, while continuing to exploit the rich alluvial plains on the coast. At this time Futunan society seems to have consisted of separate autonomous units organised along kinship lines and

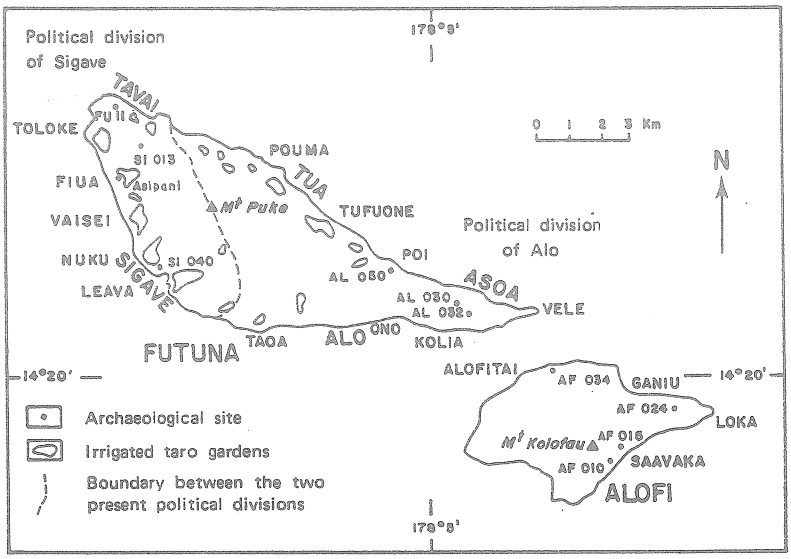
Indo-Pacific Prehistory Assn. Bulletin 11, 1991:124-140 (P. Bellwood ed., *Indo-Pacific Prehistory 1990,* Vol 2)
* ORSTOM, BP A5 Nouméa Cedex, New Caledonia

occupying well-defined territories. We call this period *Kele Mea* from the name the Futunans give to the ochre-coloured earth of the plateaux (Frimigacci and Vienne 1987).

The third and final period of Futunan chronology we call *Kele Kula*, or brown earth, which in the local language refers to the mud of the irrigated taro gardens (Frimigacci and Vienne 1987). The small political units of the previous period are now grouped along the coast under the control of chiefs, powerful holders of titles. We are seeing the development of strong chiefdoms, over which there is a paramount chief, called *Sau*.

THE ENVIRONMENT

On Futuna, product of recent submarine volcanism of Pliocene to Pleistocene age (Grzesczyk *et al.* 1988), people found an environment much more diversified than on coral atolls. Altitude (Mount Puke rises to just over 500 m), drainage network (there are several permanent streams) and quality of soils (red clay soils and young poorly developed soils) have contributed to the richness of the essentially forest vegetation, dense, evergreen and damp.



FU 11	Tavai	AL 030	Lafua	AF 015	Poutasi
SI 001	Asipani	AL 032	Matauta	AF 024	Filisia
SI 013	Moasa	AL 050	Falevai	AF 034	Malaemalu
SI 040	Lekoko	AF 010	Asau		

FIGURE 1: ARCHAEOLOGICAL SITES ON FUTUNA AND ALOFI

Human settlement had its detrimental effect on this forest. In the course of horticulture large areas were cleared, new species planted and secondary forest established. Primary forest now only survives in some valleys of difficult access, perhaps 30% of the land surface (Morat and Veillon 1985). Elsewhere it has given place to

gardens, planted trees and heathland dominated by ferns (*Dicranopteris linearis*), called *toafa* by the Futunans.

At the time of European contact the island was divided into different *kolo*, chiefly territories, in the course of regrouping. These *kolo* (Tua, Asoa, Alo etc.) were under the authority of titled men. Cutting across this aristocratic partition of space was a division of the island into *kaiga*, long strips of land stretching from the sea shore to the cookhouse zone in the case of the smaller ones and, in the case of the larger, to the forest. This division into *kaiga* is not unique to Futuna: the same is found, for example, in Kiribati (Latouche 1984:26).

The members of a *kaiga* form a self-sufficient unit of production, comprising one or more extended families - married couple, children young and married and grandparents. They provide for their daily needs, as well as for social and ritual obligations in the form of exchanges of foodstuffs between members of the same *kutuga* or lineage.

The dominant crops are taro (*Colocasia esculenta*) and yam (*Dioscorea* spp.). Planted side by side or in segregated gardens, they have produced horticultural systems which range from extensive to intensive, the former dominating the dryland cultivations, the latter the wetland. Irrigated taro gardens, dependent on the natural drainage system and gently sloping land, occupy the alluvial plains (Figure 1).[3] Gardens under swidden, with long cycles of fallow, are established higher up, on slopes which are sometimes very steep.

Traditional wet-taro gardens are pondfields retained by logs or low stone walls. Channels dug in the earth or even rock bring water to the places where the plants bathe their feet. Dryland gardens are mixed cultivations: yams, various Araceae and bananas are generally planted side by side. The yams are put into small mounds of earth, while cuttings of *Alocasia* and *Colocasia* are planted in holes made by a digging stick.

EARLY FUTUNAN SUBSISTENCE

The sites belonging to the first period of Futunan settlement, Asipani, Malae Malu and Tavai, the last dug by Kirch (1976; 1981), are found on the coast (Figure 1). The bottom levels at Asipani are characterised by pottery decorated with Lapita motifs, incised, stamped or impressed, which has been grouped under the name of Asipani pottery (Frimigacci and Vienne 1987). Decoration is uncommon: only 26 sherds of the 2000 found at Asipani were decorated. It is impossible, therefore, to say whether this Asipani pottery is related to the Early Eastern Lapita type defined by Green (1974).

More recent pottery, which we call Tavai, is characterised by the absence of decoration and carination and the presence of straight rims, flat lips and thick, round bases (Frimigacci 1990:47, 165-167; Sand 1990). Asipani is the type site for these early times. Occupied 2000 years ago (2050±280 BP, Gif-7489),[4] this habitation site, rich in pottery of both Asipani and Tavai type, became in the course of the first millennium AD a zone of cultivation.

Molluscs and fish are rare on sites of the Kele Uli period (with the exception of Malae Malu on the adjacent island of Alofi) and there are no other faunal remains. The pH values for Asipani are almost neutral, between 6.4 and 6.8, so that the absence of bone

cannot be explained by the acidity of the soil. Thus, fishing and shellfish collecting seem to have been marginal activities compared to other Lapita sites (reviewed by Butler 1988 and Nagaoka 1988). There is no lagoon on Futuna proper and subsistence therefore had to be based, as today, on horticulture and arboriculture.

Fish remains, fishing gear (fishhooks and basalt sinkers) and marine shells (Arcidae, Conidae, Tridacnidae and Trochidae) have, on the other hand, been recovered from the site of Malae Malu. This coastal station, whose occupation goes back to 2340±280 BP (Gif-7485), is situated close to the one little lagoon present on Alofi. Obviously the presence of this lagoon facilitated the activities of fishing and shellfish collection.

PLATE 1: GRINDING STONE FROM TAVAI, WITH SMALL DEPRESSIONS WHICH POSSIBLY SERVED FOR CRACKING NUTS

The only dated finds relating to vegetable foods include a grinding stone which has round its rim small depressions possibly serving for cracking nuts (Plate 1). This we found immediately adjacent to Kirch's excavation trench at the Tavai site and *in situ* in the equivalent of his Layer IX, which he has dated to 2120±80 BP (I-8355) (Kirch 1976:40; 1981:131). There are also 31 "chert" flakes from the old levels of Asipani which could have been used for scraping tubers. Kirch (1976:40; 1981:139-140, 141) recovered both nut-cracking stones and chert flakes from Tavai.

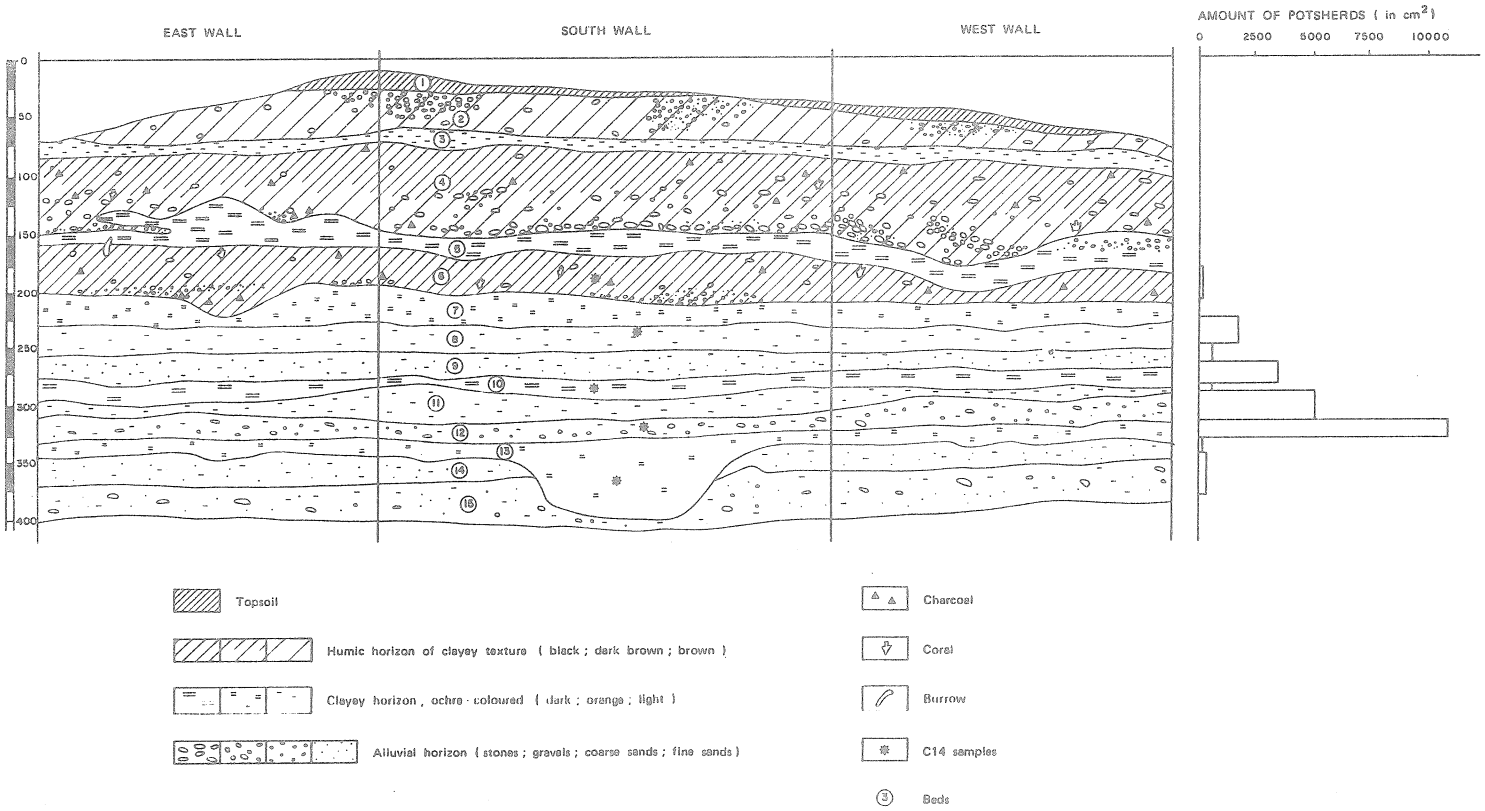


FIGURE 2: SCHEMATIC STRATIGRAPHIC SECTION OF ASIPANI (S1 001)

THE ANCIENT GARDENS OF THE KELE MEA PERIOD

The archaeological visibility of horticultural sites is a complex problem. The evidence is often restricted to a horizon rich in organic matter and poor in larger elements, like river pebbles or different rocks. The appellation "stratigraphic site" pretty well describes such gardens of which there are no concrete remains.

The oldest gardens on Futuna go back to the Kele Mea period. Excavations at the site of Asipani (Figure 2) led to the discovery of the oldest irrigated taro garden (bed 6) and two horticultural horizons (beds 4 and 2), stratified above the levels containing pottery of Tavai type and beneath an existing dryland garden (bed 1), planted to bananas. The Asipani excavations covered an area of about 13 m^2. Cleaning of the lower humic horizon (bed 6) exposed quite specific evidence for horticulture: a channel and taro planting holes (di Piazza 1990; Frimigacci 1990:59 and Photo 8). All these features formed hollows in the ground which were filled up with alluvium (Plate 2). A charcoal collection was made, remains of ancient episodes of burning off. A radiocarbon date (Gif-7487) showed the pondfield to go back to 1120±70 BP.

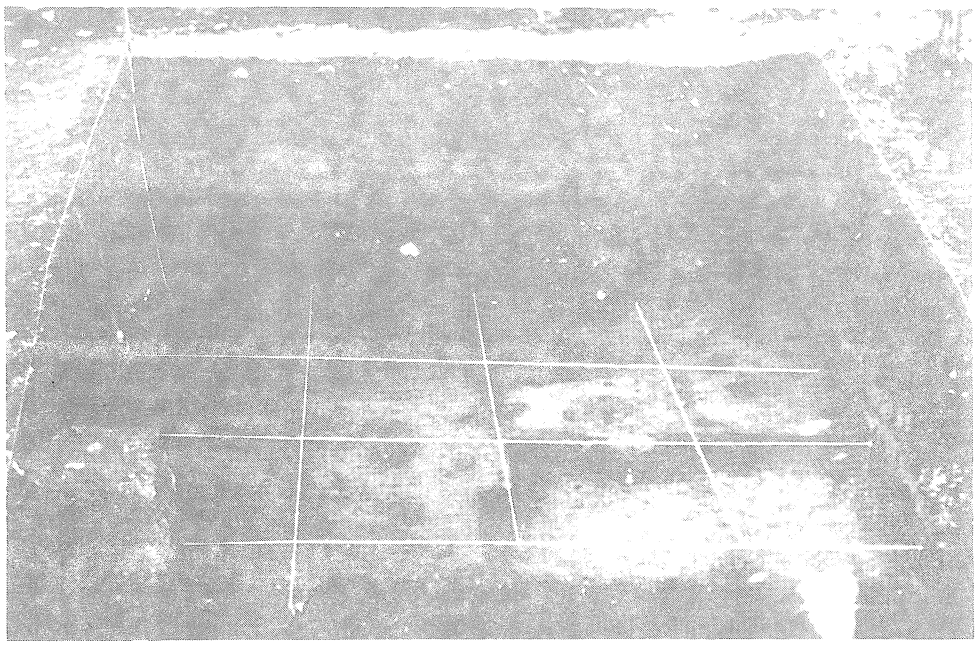


PLATE 2: TARO PLANTING HOLES AT ASIPANI

The 68 taro planting holes are of varied size, shape and depth. Circular, oval or irregular, their diameters ranged between 7 and 20 cm and their depths between 10 and 15 cm. No

particular organisational principle seems to inform their distribution. If even rough alignments are not perceptible, it seems nevertheless that two instances of a triangular configuration may be intentional, probably a *toomaga*. This is a planting technique used today, whereby, when the planting stock is of large size, the cuttings are not put three or four to a hole in the normal way but one by one in a triangle of closely spaced holes.

The channel, running west to east and about 3 m long, 70 cm wide and 20 cm deep, is not deep enough for pondfield irrigation. We think that it is a disposal drain. This interpretation rests on a comparison with irrigated pondfields today. The only channels which are both shallow and cut across a pondfield through the planted taro are precisely disposal drains, dug to drain the gardens before harvesting the tubers.

A second channel was located in the southeast part of the excavated area. Only extended excavation would allow us to propose a purpose for this feature, determine its size and establish its possible articulation with the first channel described above.

Pondfield cultivation of taro, the random disposition of the plants, the presence of a disposal drain and the triangular arrangement of some planting holes form a complex of techniques still employed today on Futuna.

Pedological and palynological examination of the stratigraphy of Asipani allows us to think that some higher strata (beds 2 and 4) are also horticultural horizons. These beds are clayey in texture, rich in organic matter and poor in stone, and contain some charcoal. Dark brown in colour, these humic horizons are distinguished from the clayey strata covering them, which are ochre-coloured and have coarse inclusions like stones and gravels.

The materials covering each of the three horticultural horizons are sediments almost certainly deposited by the river in flood. After every exceptional climatic event (cyclonic depression), the cultivators would have had to restore the flooded gardens. The only way to explain the filling of the taro holes and the disposal drain with river sediments is to suppose that people took the tubers out of the pondfield mud a little time before the flood, so that the open holes had no opportunity to close up before the influx of alluvium. It is probable that the plants were mature at the time of the flood. This would be indicated by the disposal drain, dug to remove the water from the gardens some time before harvesting.

Systematic search along river banks on Futuna, accompanied by cleaning of the different stratigraphic occurrences and by test pits, has led to the discovery of three additional horticultural horizons on the Leava (dated to 610±90 BP, Gif-8468), the Sauma and the Sausau. These humic strata, buried beneath 1.20-1.50 m of alluvium, are situated below active pondfields. The alluvial plains of the island seem to represent a favourable environment from the point of view of the visibility of ancient gardens, which require a sufficiently long time under cultivation for them to be imprinted in the soil. It is in this setting that Kirch uncovered the horticultural horizon at Tavai, dated to 1315±175 BP (I-9942) (Kirch 1981:130).

All these garden sites have been the subject of pollen analysis. Only the horticultural horizons are rich in pollen and spores. As for the beds of alluvial origin, the different

mode of deposition and the abrasive action of stone and other coarse materials on pollen and spores would account in part for the low number of specimens recovered.

The pollen diagrams for the different horticultural horizons are presented here in summary form: they are the subject of further work by di Piazza (cf. 1990:159). They present the same general picture, that of degradation of the primary forest (Tables 2-5). They are characterised by increased representation of herbaceous vegetation (Cyperaceae, Graminae and Leguminosae) and of ferns, a complex of plants which are the first to colonise after forest clearance. Ferns, whose growth is favoured on damp ground, seem to be a good marker for irrigated gardens. This secondary vegetation is found in association in the diagrams with some cultivated plants, almost certainly giant taro (*Alocasia macrorrhiza*), banana (*Musa* spp.) and some Moraceae (*Artocarpus* ?), which could have been planted, just as today, on the edge of the pondfields. Some plants of the surrounding country, like *Casuarina*, *Acacia* and *Pometia*, though not numerous, relate to environments as varied as *toafa*, littoral forest and dense forest.

SITE	DEPTH (in m)	CULTURAL CONTEXT	DATE BP (& Gif no.)	CALIBRATED RANGE (2s.d.)
Asipani	1.60 (bed 6)	taro pondfield	1120 ± 70 (7487)	+ 775, +1030 (2)
	2.00 (bed 8)	Tavai II	2180 ± 280 (7488)	- 810, + 330 (2)
	2.40 (bed 10)	Tavai I (with paddle-impressed pottery)	2000 ± 80 (8067)	- 237, + 175 (1)
	3.00 (bed 12)	Asipani	2400 ± 80 (8068)	- 781, - 342 (1)
	3.20 (bed 13)	Asipani	2050 ± 280 (7489)	- 770, + 460 (1)
Malae Malu location A	1.17	Tavai I	1860 ± 60 (8064)	+ 68, + 234 (1)
Malae Malu location B	0.80	Tavai II (Micronesians?)	1500 ± 80 (7484)	+ 265, + 640 (2)
	1.40	Tavai I	2340 ± 280 (7485)	-1035, + 210 (2)
Leava	1.40	taro pondfield	610 ± 90 (8468)	+1245, +1445 (3)
Mata Uta	0.60 (fig. 4 at A)	disturbed level	1010 ± 70 (8066)	+ 888, +1182 (1)
	0.78 (fig. 4 at B)	undisturbed level	1140 ± 50 (7486)	+ 670, +1020 (2)
Lafua	0.60	horticultural level? broken pottery	400 ± 40 (8065)	+1437, +1623 (1)
Moasa	1.12	horticultural level	350 ± 50 (8061)	+1452, +1641 (1)
	2.10	horticultural level 1 potsherd	470 ± 140 (8062)	+1260, +1680 (3)
	2.30	horticultural level	200 ± 80 (7483)	+1485, +1950 (2)
	3.06	base of excavation (under water)	1170 ± 100 (8063)	+ 675, +1027 (1)

In the final column - = BC, + = AD; (1) Pazdur and Michczynska pers. comm. (2) Klein et al. 1983 (3) Stuiver and Reimer 1986

TABLE 1: RADIOCARBON DATES FOR SITES ON FUTUNA AND ALOFI

IDENTIFICATION OF POLLEN	NUMBER OF GRAINS	%	BIOTOPE
Araceae			
Alocasia	29	16	Garden
Colocasia?	1	0.55	Garden
Casuarinaceae			
Casuarina	1	0.55	Toafa
Graminae	10	5.5	Secondary vegetation
Melastomataceae	6	3.3	Toafa
Mimosaceae			
Acacia	9	4.9	Littoral forest
Moraceae/Urticaceae	11	6	Littoral forest
Musaceae?	12	6.6	Garden
Pandanaceae			
Pandanus	4	2.2	Toafa
Freycinetia?	10	5.5	Toafa
Unknown	19	10.5	
Monolete spores	70	38.67	Secondary vegetation
Trilete spores	18	9.9	Secondary vegetation
Total	200		

TABLE 2: PALYNOLOGY OF THE PONDFIELD (BED 6) AT ASIPANI (ASIPANI RIVER)

HORTICULTURE ON THE PLATEAUX

The slopes and plateaux of the island are the areas suitable for shifting cultivation under long fallow. Moasa is an upland site, situated in the interior of the valley of the Vailala on the edge of *toafa*. Excavation produced evidence of four horticultural horizons composed of a humic clay material (Figure 3; cf. Frimigacci 1990:Photo 15). The oldest garden is dated to 1170±100 BP (Gif-8063). A single piece of pottery was recovered in the second horticultural horizon, dated to 470±140 BP (Gif-8062).

Inside the ancient fort of Mata Uta Frimigacci discovered evidence, not indeed of a garden, but almost certainly of a pit for breadfruit fermentation (*masi*) (bed 8 of Figure 4; cf. Frimigacci 1990:Figure 45). A substantial hole about 140 cm wide and 90 cm deep was dug into clay. The function proposed for this feature relies on ethnographic comparison and the interpretation made of it by the local people. The level to which the structure is related is bed 6 (Figure 4), dated to 1140±50 BP (Gif-7486) and characterised by pottery of Tavai type (Frimigacci 1990:168-169).

IDENTIFICATION OF POLLEN	NUMBER OF GRAINS	%	BIOTOPE
Araceae Alocasia	2	3.4	Garden
Graminae	8	13.7	Secondary vegetation
Liliaceae Cordyline	1	1.7	Secondary vegetation
Melastomataceae	1	1.7	Toafa
Mimosaceae Acacia	3	5	Littoral forest
Moraceae/Urticaceae	5	8.6	Littoral forest
Myristicaceae	5	8.6	Littoral forest
Musaceae?	1	1.7	Garden
Plantaginaceae?	4	6.8	Secondary vegetation
Rutaceae?	1	1.7	Dense forest
Unknown	16	27.5	
Monolete spores	9	15.5	Secondary vegetation
Trilete spores	2	3.4	Secondary vegetation
Total	58		

TABLE 3: PALYNOLOGY OF LEAVA (LEAVA RIVER)

A third upland site was recorded on the plateau of Asoa, in the very precincts of the former village of Lafua, close to the fort of Mata Uta. Excavation did not produce evidence of structures but of a humic, possibly horticultural horizon, rich in charcoal, beneath 60 cm of sediment and associated with some sherds of broken pottery, which might therefore be dated by the radiocarbon age of 400±40 BP (Gif-8065) for charcoal in the bottom of the horizon.

HORTICULTURE, ORAL TRADITION AND CHIEFTAINSHIP

According to oral tradition collected by Frimigacci and Vienne (Frimigacci 1990:49-50), the pondfields and wells of Futuna owe their origin to the Agaifo, founders of the village of Malae Malu at Alofitai. These Agaifo could well be the famous Chinese said to have arrived in Futuna before the days of the mission (Burrows 1936:54). According to Burrows (1936:55), these "Chinese" (Siaina in Futunan) could have been migrants from the Marshall Islands, since not only are the fine checked designs on certain kinds of barkcloth, said by some authorities to have been learned from the "Chinese", strikingly

IDENTIFICATION OF POLLEN	NUMBER OF GRAINS	%	BIOTOPE
Annonaceae Cananga	1	0.5	Secondary vegetation
Araceae Alocasia	7	4	Garden
Chenopodiaceae?	1	0.5	Secondary vegetation
Cyperaceae	6	3.4	Secondary vegetation
Ericaceae	1	0.5	Dense forest
Graminae	18	10.3	Secondary vegetation
Lauraceae?	6	3.4	Secondary vegetation
Liliaceae Cordyline	3	1.7	Secondary vegetation
Malvaceae	3	1.7	Secondary vegetation
Mimosaceae Acacia	3	1.7	Littoral forest
Moraceae/Urticaceae	7	4	Littoral forest
Musaceae?	5	2.8	Garden
Myristicaceae	20	11.5	Dense forest
Myrtaceae	1	0.5	Secondary vegetation
Pandanaceae	7	4	Toafa
Plantaginaceae?	12	6.9	Secondary vegetation
Rubiaceae?	4	2.3	Dense forest
Rutaceae?	1	0.5	Dense forest
Unknown	37	21.2	
Monolete spores	25	14.3	Secondary vegetation
Trilete spores	6	3.4	Secondary vegetation
Total	174		

TABLE 4: PALYNOLOGY OF VAISEI (SAUMA RIVER)

IDENTIFICATION OF POLLEN	NUMBER OF GRAINS	%	BIOTOPE
Araceae Alocasia?	9	8.8	Garden
Ericaceae?	2	2	Dense forest
Graminae	9	8.8	Secondary vegetation
Leguminosae Vigna?	1	1	Secondary vegetation
Melastomaceae	1	1	Secondary vegetation
Mimosaceae Acacia	2	2	Littoral forest
Moraceae/Urticaceae	3	3	Littoral forest
Musaceae?	6	5.8	Garden
Myristicaceae	1	1	Dense forest
Palmae Cocos?	1	1	Garden
Pandanaceae	1	1	Toafa
Taccaceae	3	3	Secondary vegetation
Unknown	15	14.7	
Monolete spores	45	44	Secondary vegetation
Trilete spores Cyathea	3	3	Secondary vegetation
Total	102		

TABLE 5: PALYNOLOGY OF NUKU (SAUSAU RIVER)

different from those of neighbouring islands, but their regular cross-hatching, which suggests imitation of a mat, bears an especially close resemblance to the mats of the Marshalls. The *Tridacna* adzes discovered in stratigraphic context at the site of Malae Malu, whose foundation, as mentioned above, is attributed to the Agaifo, are "Micronesian" in character (Frimigacci 1990:78), being made from the ventral margin of the shell and preserving its natural corrugated surface (cf. Davidson 1971:56-58).

It may be of interest that the excavations put the foundation of Malae Malu at 1500±80 BP (Gif-7484) and thus a little earlier in time than the use of the pondfield at Asipani. We cannot, however, be certain that it was the Agaifo who were responsible for

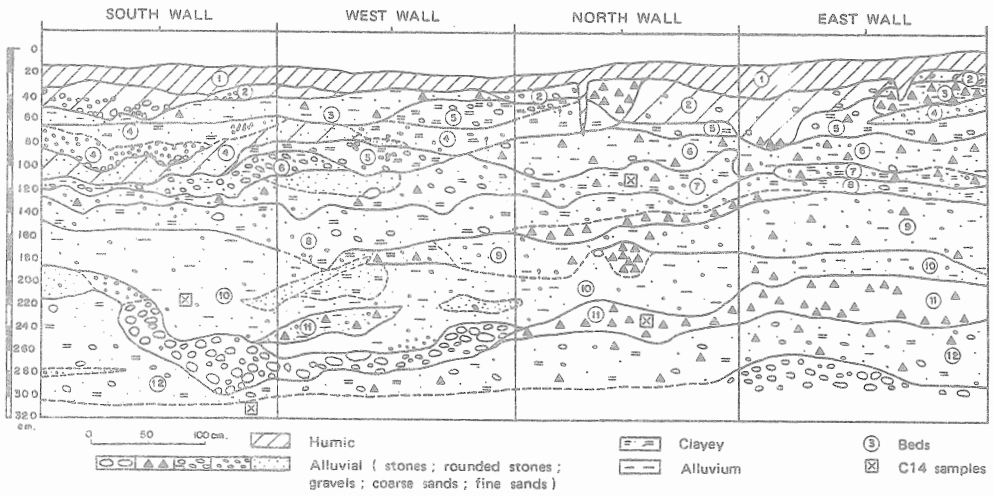


FIGURE 3: STRATIGRAPHIC SECTION OF MOASA (S1 013)

the irrigated gardens of Futuna, all the more because oral tradition situates the innovations introduced by them in a recent period, around the 17th century (Frimigacci 1990:162). Alofitai would perhaps be a very ancient Micronesian landing place abandoned not very long ago, which would explain the oral tradition relating to the place.

Both archaeological excavations and oral traditions give evidence of horticultural development well before the appearance on Futuna of a system of powerful chieftainship, consisting of title holders under a paramount chief or *Sau*.

The history of the last three hundred years of Futunan history is marked by the grouping of small chiefdoms into more consequential political units (Frimigacci 1990:162-164). For example, Tavai became larger by absorbing the *kolo* of Toloke and then of Fiua. Sigave is the product of the grouping of the *kolo* of Nuku, Leava and Vaisei. Further east, the *kolo* of Taoa, Ono, Kolia and Malae came to form the political entity of Alo. The territory of the chiefdom of Asoa combines the *kolo* of Ava, Laloua, Vele and Kolotai. To the north the chiefs of Anakele, falling under the sway of Veliteki, are the origin of Tua, which groups the *kolo* of Pouma, Fikavi, Fakaki and Poi and the subordinate *kolo* of Tufuone, Tamana and Olu.

Reference to the genealogical traditions shows the first *Aliki Sau* of Futuna to be Fakavelikele. History tells us that this great chief was none other than the head of the *kolo* of Anakele, which around 1700 grew in importance. But we must wait for Veliteki, *Aliki Sau* from 1756-1784, to see a real coming together of the *kolo* of Tua, Asoa and Alo, from which he formed the "kingdom" we call Alo, because he built his residence there. As for the "kingdom" of Sigave, it is not until 1842 that someone came to dominate the political scene. This was Kaumanene, who carried the title of Kaifakaulu.

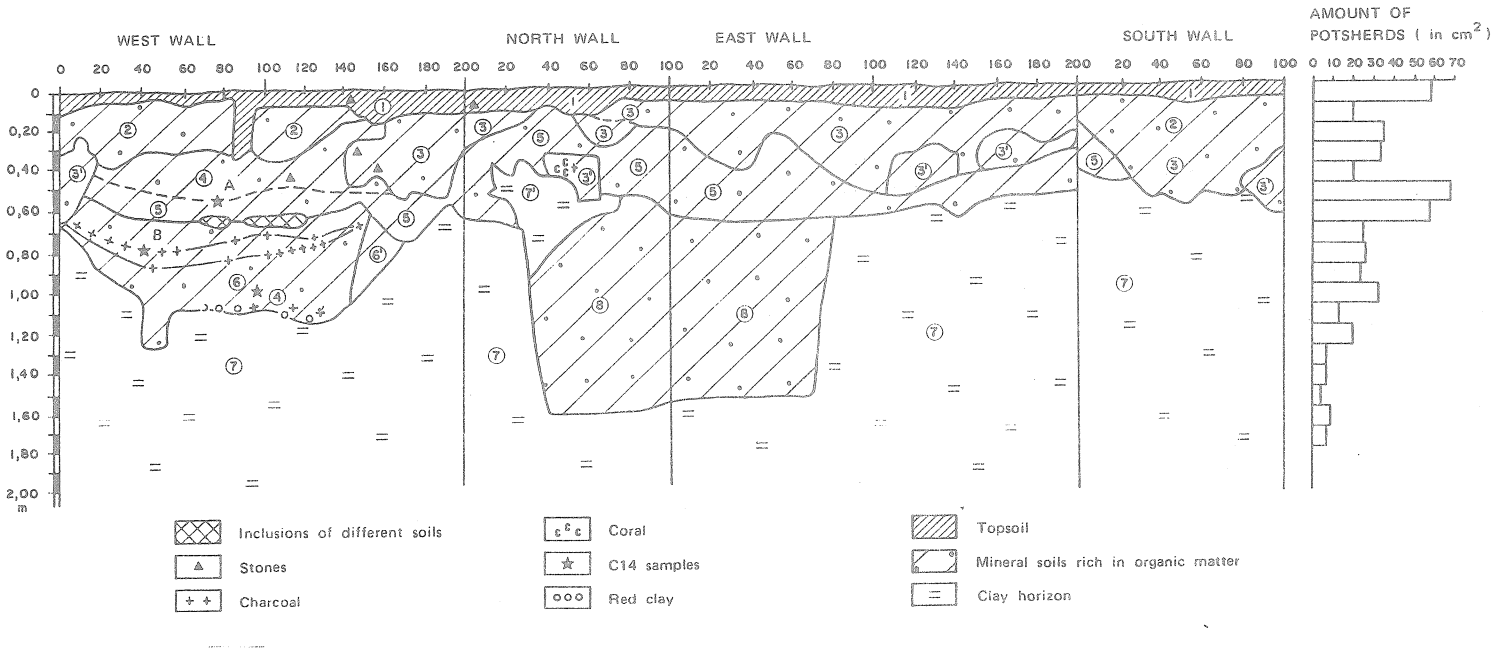


FIGURE 4: SCHEMATIC STRATIGRAPHIC SECTION OF MATA UTA (AL 032B)

The first signs of horticulture on Futuna, consisting of pondfield construction (at Asipani) as well as swiddening (at Moasa), go back to the Kele Mea period, thus well before the development and stratification of the political system as recorded in oral tradition. It seems then that the relationship between developed chieftainship and irrigation is not as systematic as one has wished to think.

Archaeological survey also shows us that during the Kele Mea period people occupied the interior valleys and the plateaux (at Mata Uta, Lafua, Moasa and Asoa). While it is true, Futuna being an island of no great size, that these sites are not very distant from the alluvial plains where the irrigated gardens are found, it nevertheless appears that people did not systematically settle in proximity to their cultivations. The situation is quite different from the pattern of settlement today, when the islanders are distributed on the littoral zone. Population growth, but also relationships of hostility in the past, are amongst the factors that could have led to upland settlement. Being of steep and difficult access, the plateaux are zones of refuge more easily defended than the flat alluvial plains.

According to oral tradition, the system of food distribution called *katoaga*, which establishes the prestige of title-holders, is of recent introduction to Sigave, allegedly from Pouma (a political unit within Tua) by the Saagogo title, whose genealogy goes back to around 1650. The 17th century is also the time when the different chiefly territories were grouped into more important units. Was the emergence of the great chiefdoms, based on the redistribution of tubers, kava roots and pigs, responsible for a greater utilisation of the earth oven, an extremely practical method of cooking the significant quantities of foodstuffs necessary in the preparation of a *katoaga*, and thus for the abandonment of pottery use on Futuna? Pottery manufacture seems to end in western Polynesia at the beginning of our era, or that is what appears to be the case in Tonga and Samoa (Dye 1989; cf. Poulsen 1987:153). On Futuna the upland sites of Moasa and Asoa, whose occupation dates range from the 8th to the 16th century, have produced some potsherds. Did pottery go out of use later on Futuna than the other islands? The question of the abandonment of pottery and its possible link with the emergence of powerful chieftainships and the ceremonial exchange of foodstuffs merits particular attention with respect to Futuna.

ACKNOWLEDGEMENTS

We acknowledge the cooperation of B. Vienne, J.P. Siorat and C. Sand and the financial support of ORSTOM, CNRS and CORDET.[2] Many people lent their assistance on Futuna and in Noumea and Paris. Particular thanks are due to Muni Keletaona and Sakopo Tialetagi (Futuna), Jean Fages (ORSTOM-Nouméa) and Joël Bonnemaison (ORSTOM-Paris).

NOTES

1 Submitted in French and translated by J. Golson.

2 ORSTOM = Office de la Recherche Scientifique et Technique d'Outre-Mer; CNRS = Centre National de la Recherche Scientifique; CORDET = Commission de Coordination de la Recherche dans les Départements et Territoires d'Outre-Mer.

3 All figures have been modified by Ian Faulkner, Department of Prehistory, Research School of Pacific Studies, Australian National University, to supply English translations of the original French.

4 All our radiocarbon dates are uncalibrated in the text and calibrated in Table 1.

REFERENCES

Barrau, J. 1963. L'agriculture des îles Wallis et Futuna. *Journal de la Société des Océanistes* 29:157-171.

Burrows, E.G. 1936. *Ethnology of Futuna*. Honolulu: Bernice P. Bishop Museum, Bulletin 138.

Butler, V.L. 1988. Lapita fishing strategies: the faunal evidence. In P.V. Kirch and T.L. Hunt (eds), *Archaeology of the Lapita Cultural Complex*, pp.99-115. Seattle: Burke Museum, Thomas Burke Memorial Washington State Museum Research Report No. 5.

Davidson, J.M. 1971. *Archaeology on Nukuoro Atoll.* Auckland: Auckland Institute and Museum, Bulletin No. 9.

Di Piazza, A. 1990. Les jardins enfouis de Futuna: une ethno-archéologie de l'horticulture. *Journal de la Société des Océanistes* 91:151-162.

Dye, T.S. 1989. *Social and Structural Change in the Prehistory of the Ancestral Polynesian Homeland.* Ann Arbor: University Microfilms International.

Frimigacci, D. 1990. *Aux Temps de La Terre Noire: Ethnoarchéologie des Iles Futuna and Alofi.* Paris: Editions Peeters, Collection Selaf 321, Langues et Cultures du Pacifique 7.

Frimigacci, D. and Vienne, B. 1987. How they became Polynesian: an ethnoarchaeological investigation of Futuna and Uvea. *Man and Culture in Oceania* 3, Special Issue:117-119.

Green, R.C. 1974. A review of portable artifacts from Western Samoa. In R.C. Green and J.M. Davidson (eds), *Archaeology in Western Samoa, Vol. 2,* pp.245-275. Auckland: Auckland Institute and Museum, Bulletin No. 7.

—— 1979. Lapita. In J.D. Jennings (ed.), *The Prehistory of Polynesia*, pp.27-60. Cambridge (Mass.) and London: Harvard University Press.

Groube, L.M. 1971. Tonga, Lapita pottery and Polynesian origins. *Journal of the Polynesian Society* 80:278-316.

Grzesczyk, A., Monzier, M., Lefèvre, C., Butterlin, J., Dupont, J., Eissen, J.-P., Glaçon, G., Mailliet, P. and Muller, C. 1988. Géologie des îles Futuna et Alofi (T.O.M. des îles Wallis et Futuna, Pacifique sud-ouest): données préliminaires. *Géologie de la France* 2-3(1988):131-134.

Hunt, T.L. 1981. New evidence for early horticulture in Fiji. *Journal of the Polynesian Society* 90:259-266.

Kirch, P.V. 1975. *Cultural Adaptation and Ecology in Western Polynesia: an Ethnoarchaeological Study.* Unpublished PhD thesis, Yale University.

----- 1976. Ethno-archaeological investigations in Futuna and Uvea (western Polynesia): a preliminary report. *Journal of the Polynesian Society* 85:27-69.

----- 1978. Ethnoarchaeological approaches to the study of agricultural systems in the humid tropics. In R.A. Gould (ed.), *Explorations in Ethnoarchaeology,* pp.103-125. Albuquerque: University of New Mexico Press.

----- 1981. Lapitoid settlements of Futuna and Alofi, western Polynesia. *Archaeology in Oceania* 16:127-143.

Kirch, P.V. and Yen, D.E. 1982. *Tikopia: the Prehistory and Ecology of a Polynesian Outlier.* Honolulu: Bernice P. Bishop Museum, Bulletin 238.

Klein, J., Lederman, J.C., Damon, P.E. and Ralph, E.K. 1983. Calibration des dates radiocarbones. *Revue d'Archéométrie (Supplément 1983)*:22-43.

Latouche, J.P. 1984. *Mythistorie Tungaru: cosmologie et généalogies aux Iles Gilbert.* Paris: Selaf.

Morat, P. and Veillon, J.M. 1985. Contribution à la connaissance de la végétation et de la flore de Wallis et Futuna. *Bulletin du Muséum d'Histoire Naturelle* 7:259-340.

Nagaoka, L. 1988. Lapita subsistence: the evidence of non-fish archaeofaunal remains. In P.V. Kirch and T.L. Hunt (eds), *Archaeology of the Lapita Cultural Complex*, pp.117-133. Seattle: Burke Museum, Thomas Burke Memorial Washington State Museum Research Report No. 5.

Poulsen, J. 1987. *Early Tongan Prehistory, Vol. 1.* Canberra: Australian National University, Research School of Pacific Studies, Department of Prehistory, Terra Australis 12.

Sand, C. 1990. The ceramic chronology of Futuna and Alofi: an overview. In M. Spriggs (ed.), *Lapita Design, Form and Composition*, pp.123-133. Canberra: Australian National University, Research School of Pacific Studies, Department of Prehistory, Occasional Papers in Prehistory No. 19.

Spriggs, M. 1981. *Vegetable Kingdoms: Taro Irrigation and Pacific Prehistory*. Unpublished PhD thesis, Australian National University.

----- 1986. Landscape, land use and political transformation in southern Melanesia. In P.V. Kirch (ed.), *Island Societies*, pp.6-19. Cambridge: Cambridge University Press, New Directions in Archaeology.

Stuiver, M. and Reimer, P.J. 1986. A computer program for radiocarbon age calibration. *Radiocarbon* 28:1022-1030.

Yen, D.E. 1973. Agriculture in Anutan subsistence. In D.E. Yen and J. Gordon (eds), *Anuta: a Polynesian Outlier in the Solomon Islands*, pp.113-149. Honolulu: Bernice P. Bishop Museum, Department of Anthropology, Pacific Anthropological Records No. 21.

----- 1974. Arboriculture in the subsistence of Santa Cruz, Solomon Islands. *Economic Botany* 28:247-284.

----- 1976. Agricultural systems and prehistory in the Solomon Islands. In R.C. Green and M.M. Creswell (eds), *Southeast Solomon Islands Cultural History,* pp.61-74. Wellington: Royal Society of New Zealand, Bulletin 11.