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Volume V
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Melanesia

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TROPICAL RAINFOREST PEOPLES TODAY

Volume V

PACIFIC REGION
Melanesia

Christin KOCHER SCHMID and Roy ELLEN

Scientific Editors

Future of
The Rainforest People Program
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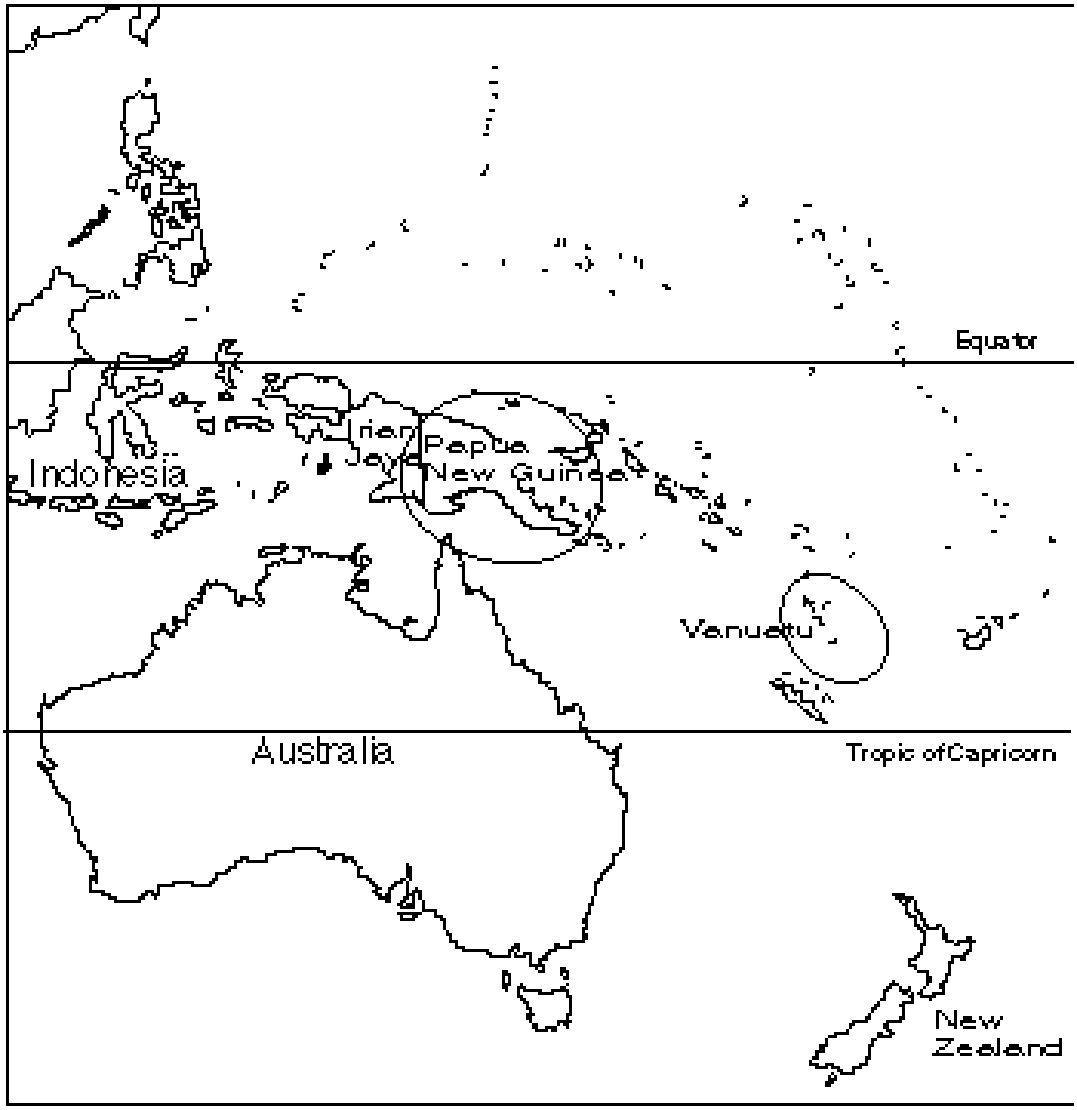
Retour sommaire

Table of contents Volume 5 - PACIFIC



Research Sites of FTP

I
OVERVIEW

Christin KOCHER SCHMID

SUMMARY

The research of the NRI (National Research Institute)-FRP team followed the outline set out in a questionnaire for the IIED (International Institute for Environment and Development) Country Study on Papua New Guinea, "Policy that Works for Forest and People". It contains a detailed set of research questions on issues of land use and forest management in rural communities (see appendix 1). This questionnaire was prepared by Colin Filer (NRI), Nikhil Sekhran (PNG Conservation and Resource Centre), Brian Brunton (Greenpeace), and Basil Peutalo (WWF-PNG). It was answered by expatriate social scientists working predominantly in rural areas throughout Papua New Guinea and by national university students. By incorporating these questions into our methodology, the results of NRI-FRP research can be compared to these existing data (Sillitoe, Filer n.d.). For the purpose of this report, the questionnaire has been slightly modified and was also answered by most other APFT/FRP researchers working in Melanesia. This introductory summary to our research follows, therefore, the structure of the IIED questionnaire, some detailed data are placed in tables (appendix 2) but commented upon in the text.

INTRODUCTION TO MELANESIA

Papua New Guinea, the Solomon Islands and Vanuatu belong geographically and culturally to Melanesia. In all three countries the same lingua franca, Neo-melanesian, in different mutually understandable variations is used: Pidgin in Papua New Guinea, Pijin in the Solomon Islands, Bislama in Vanuatu.

APFT is active in three Melanesian countries of the Southwest Pacific: Papua New Guinea, Vanuatu and the Solomon Islands. These three Pacific nations exhibit many similarities: they are part of the Melanesian island chain stretching from just South of the equator in a South-eastern direction into the Pacific. They are subject to similar climatic conditions with high monsoonal rainfall regimes and also occasional cyclones, and the drought caused by the recent El Niño Southern Oscillation has seriously afflicted them. Their natural environment exhibits many common biotic elements, and there is not only a high natural but also a high cultural diversity. Their early colonial histories were similar: contacted first by Spanish and Portuguese explorers, then colonised by France, Germany and Great Britain in various combinations.

The majority of the population of all three countries live in rural areas and their lives are based on a subsistence economy which makes use of a similar range of mainly tuberous staple crops. Their economic situation is also quite similar: low GNP and an export balance heavily dependent on the foreign driven extraction of natural resources (logging and mining) besides mainly small-scale cash-cropping (copra, coffee, tea, cocoa, oil palm and others). The secondary and tertiary sectors of the economy are underdeveloped. The three nations gained their independence between 1975 and 1980.

Besides these common traits, there are also differences. The mainland of Papua New Guinea is the only large mass of land and the only island with high altitude (more than 2.000m ASL) areas. The islands which make up the Solomon Islands and Vanuatu are by comparison, numerous and low-lying. While Papua New Guinea and the Solomon Islands were was settled early (at least 40.000 years ago), human occupation of Vanuatu is more recent (about 3.000 years ago).

In conservative view, the high altitude areas of New Guinea constitute one of the earliest centres of agriculture in the world with a history of cultivation stretching back 9.000 years. However, a low altitude economy based on arboriculture combined with low intensity gardening as observed at the Kilimeri research site goes back at least 20.000 years, and there is evidence that taro was planted in the Northern Solomon Islands at least 28.000 years ago (Spriggs 1998: 54).

The interior of the Papua New Guinea mainland was much later contacted than the

islands further to the East and South. Only in 1930 the world realised that a large and dense population was living in the intermontane valleys of the Papua New Guinea mainland, while for instance the island of Espiritu Santo (Vanuatu) was contacted in 1606 by Pedro Ferdinand de Queiros. Consequently the population of the islands was for centuries subject to blackbirding and forced labour, as well as afflicted by imported diseases. This is still noticeable in the demographic differences: while Papua New Guinea shows in its densest settled montane areas a considerable population pressure, Vanuatu has lower population densities.

> *Solomon Islands: the export of unprocessed logs accounts for 50-60% of the total export revenue.*
> *Papua New Guinea: mining accounts for about 45% of the total export value.*

Demographic growth is sometimes considered responsible for an increasing decline of forest cover and an obstacle to conservation. However, in Melanesia industrial resource extraction is the main factor in the process of deforestation. Logging and mining have deeply affected the people and their environment in the Solomon Islands and in Papua New Guinea, while in Vanuatu with its smaller landmass industrial resource extraction has just begun.

1. GEOGRAPHICAL SITU ATION AND DEMOGRAPHY

Table 1: Geographical data (see Appendix 2)
Table 2: Demography (see Appendix 2)

Relevant policy areas: tropical forest, environment, population growth, health

The natural richness and diversity found in Melanesia is reflected by the APFT research sites: seashore and swamps, hilltops and mountain valleys, with varying climatic conditions and vegetation types forming the backdrop.

Melanesians have their own way to classify their forest land. Everywhere primary forest is distinguished from secondary, often expressed as "forest" versus "old garden" or "where many gardens have been cut." People whose territories include considerable differences in altitude also distinguish and have labels for different forest zones found at different altitudes. Others, where altitude is not a major factor determining species composition of forest, use the opposition between dry (hill) and wet (swamp) to distinguish between different forest zones.

The extent of forest cover is related to altitude and population densities. The low altitude sites have low population densities (0,5 to 7 people/km^2) and high percentages of forest cover (up to 99%); the high altitude sites show considerable population densities (16 people/km^2) and reduced forest cover (30-40%). Contributing factors are:

-higher vulnerability of high altitude forest to human disturbance,

-the introduction of the cold-tolerant sweet potato 200 - 300 years ago, allowing for intensified agriculture at higher altitudes (Golson 1977).

The long-term data from Nokopo demonstrate considerable population growth (+60%) for the last 10 years (see detailed report Nokopo). In contrast, the long-term data from Ikundi reveal a much slighter population growth (+10%) over the same period of time (see detailed report Ikundi). These findings are in accordance with the a model of "centrifugal" population movements out of the highland areas of Papua New Guinea, where instability and growth of population has caused an outward migration into "demographic sinks" in mid- and low altitude areas (Hyndman & Morren 1990, 25). The Ankave of Ikundi migrated to their present settlement sites from higher altitudes and exposure to endemic malaria may have kept their numbers down. The fastest growing areas in Melanesia are its modern towns.

> *Vanimo in Papua New Guinea has more than doubled its population in the last nine years, Luganville on Santo in Vanuatu doubles its population every ten years (see detailed reports on Luganville and Vanimo-Kilimeri).*

Rural-urban drift, consequential cultural rootlessness and infrastructural inadequacies are major problems in Melanesian towns. There are rural communities in Papua New Guinea with between 40 and 50% of their members permanently absent in towns (Sillitoe, Filer n.d.). At the APFT research sites absenteeism varies between 4% (Ikundi) and 22% (Haia).

2. DEVELOPMENT INDICA TORS

Table 3:Access to towns according to travelling time (see Appendix 2)
Table 4: Infrastructure and 'first contact'(see Appendix 2)
Table 5:Average annual income per household (see Appendix 2)
Table 6: Main cash generating activities (see Appendix 2)

Relevant policy areas : poverty reduction, health, education, gender, infrastructure

> *In the Kilimeri area a man earns up to Euro 120 per fortnight with wage employment and up to Euro 40 with cash cropping, but a woman earns at most Euro 12 for selling garden surplus.*

The APFT research sites reflect not only the cultural and natural diversity of Melanesia but also the varying length of the exposure of their inhabitants to the "outside world". For Pio-Tura, "first" contact was in 1957, that is well within the lifetime of many local people, while the West coast of Santo experienced it about 150 years ago.

All rural research sites are remote in terms of accessibility, infrastructure and communication. Relative proximity to an urban centre or an early contacted coast does not necessarily mean better infrastructure.

> *It takes the people of Ikundi 14 hours to reach the next government station and another 12 hours to reach Lae, Papua New Guinea's second largest city. However, they have neither access to basic education via an elementary school nor to basic health services via an aidpost. It takes the people living on the West coast of the island of Santo about the same time to get to Luganville the second largest town of Vanuatu, but almost all of their school age children (90-98%) attend elementary school and there are three aidposts in their area making for the most favourable ratio of 140 persons per aidpost of all the research sites.*

In the Papua New Guinea research sites, between 600 and 940 people have to share the services of one aidpost. There is evidence that in some places this ratio was more favourable a decade ago. Before a recent population increase at Nokopo the same aidpost (shared with a neighbouring village) served in 1987 400 people but had in 1997 to cater for 600 persons. The demographic development clearly outcompetes the infrastructural development. In addition the national economic situation has recently forced the

authorities to close 960 aidposts, that is 40% of the country's 2.400 aidposts (Papua New Guinea Post-Courier, 30/9/99). For instance in the Middle Ramu District of Madang Province 96.000 people have presently to share the services of only 25 aidposts, resulting in a ratio of 3.840 people per aidpost (Figures taken from the National, 24/11/99). This dire situation is reflected in high infant mortality rates and low life expectancy: a female child born in Papua New Guinea, either in Sandaun Province (which includes the Kilimeri and the Trangap sites) or Gulf Province (which includes the Ikundi and part of the Pio-Tura sites), can expect to live 46 years on average – 21 years less than a child born in Vanuatu (Papua New Guinea Post-Courier 2/11/99).

Most research sites can only be accessed by plane or on foot. The travelling times by plane from remote areas like Pio-Tura, Trangap or Nokopo to the nearest town are short (less than one hour) for expatriate researchers. However, the prices for these flights are for most local people prohibitive.

> *A flight from Haia at Pio-Tura to Goroka and back for example, costs 150 PNGKina (Euro 60) while people's average annual income is 720 PNGKina (Euro 285).*

Walking to town means days on bush paths (more than 100 hours for Pio-Tura as well as Trangap). It is therefore not surprising that in these areas the majority of women have never been outside their home areas and often do not speak the lingua franca - neomelanesian Pidgin.

Road access does not necessarily mean good access to towns and services. The villages of the Kilimeri area, although situated more or less close to a national highway, are in the wet season often cut off. People can still walk into town although this takes several hours but their cash crops cannot be transported, and a serious accident still means death or a handicapped life because professional medical treatment is only available in town. Aidpost orderlies in rural areas dress wounds, give penicillin injections, and administer drugs against colds, diarrhoea and malaria.

At all research sites, the average annual household incomes are low, from below E 40 (Ikundi) to E 500 (West Coast Santo). Only in those villages in the Kilimeri area, where logging is ongoing, are average annual incomes temporarily higher (up to E 8.000). However, once the logging operations are terminated, the flow of money ceases. At Krisa village in the same area and with logging terminated, the average annual income is now about E 200, thus within the same range as the other research sites where people do not benefit from an influx of logging money. The unsustainability of such a short term influx of money into the local economies is clearly demonstrated by the data from the Kilimeri site (see detailed report on Vanimo-Kilimeri).

A variety of strategies is applied by Melanesians to provide for cash income. Most prominent is cash cropping (of copra, cocoa and coffee), but where logging is incipient or in progress, dividends, royalties, and levies make for the bulk of cash income. The sale of various forest products is also important: kava *(Piper methysticum)* and sandalwood *(Santalum austrocaledonicum)* on the West coast of Santo, bark cloth *(Ficus elastica)* at Ikundi, game (meat, fur and young animals) at Pio-Tura and pork at Musula and Nokopo, as well as sago starch in the Kilimeri area. Cash is further obtained by remittances from relatives with wage labour and by sporadic wage employment. The sale of garden surplus at the local markets is - in contrast to most other cash generating activities - a female activity and yields far less money. In most areas men consider their earnings as personal spending money while women use their meagre cash incomes to provide basic necessities (e.g. salt, soap or kerosene) for their families.

Aid Post orderly attending a patient - Nokopo (cliché ©K. Schmid)

3. THE SIGNIFICANCE OF FOREST RESOURCES

Table 7: Subsistence food in order of importance (see Appendix 2)
Table 8: Recorded numbers of harvested wild plant food (see Appendix 2)

Relevant policy areas: tropical forest, nutrition, health, cultural development, gender

> *Nokopo 1987, weekly food consumption by adults:*
> - *6 kg sweet potato*
> - *2 kg banana*
> - *2 kg corn*
> - *2 kg green vegetables.*
>
> *Kilimeri 1999, local categories of food which constitute a meal:*
> - ya, *sago jelly or pancakes*
> - rabwe, *cooked vegetables and mushrooms*
> - il, *cooked or roasted meat of animals and birds, fish and grubs.*
>
> *At Musula in 1997, 60% of the protein intake of children was procured by collecting in the forest.*

For the people of the low- and mid-altitude sites in Papua New Guinea, the starch of the semi-domesticated sago palm is the most important staple (Pio-Tura, Musula, and Kilimeri). In the two high altitude sites, the cold tolerant sweet potato is cultivated by intensive gardening techniques and provides people with their staple food (Trangap and Nokopo and to a lesser degree Pio-Tura and Ikundi). Yam which needs a marked dry season to develop its tubers, is one of the main staples on the West coast of Santo while the other main staple, the moisture dependent *Colocasia* taro, is cultivated in irrigated fields. At most sites bananas are important secondary staples. At Ikundi the recently introduced *Xanthosoma* taro is the main staple and is also important on the West coast of Santo together with manioc (cassava). Both these crops are of South American origin and have been incorporated into the local subsistence economies during the last 50 years. *Xanthosoma* taro is also very important on Malo Island off the South coast of Santo, production per head being higher than with the traditional yam in West Malo. Like store bought foods, these introduced staples add flexibility and security to Melanesian food regimes by filling gaps in the seasonal supply of food (see Allen in detailed report Santo).

The share of green vegetables in people's diet is often underestimated: cultivated or wild leafy vegetables are a crucial part of the diet and eaten with every meal.

The hunting of marsupials and birds yield an important part of people's diet in most lowland areas, although native Melanesian fauna does not include large game animals other than cassowary and feral pig. In the denser settled high altitude areas, hunting by

men is more a question of sport than an important dietary contribution. Everywhere though, hunters know a broad range of prominent feeding trees of animals and birds, which they use as hides to ambush game. A large proportion of the animal protein component of the diet is procured by collecting: in the forest of all Papua New Guinea sites women and children collect insects, insect larvae and megapode eggs. Other collected protein sources include, snakes, lizards, frogs, spiders, prawns and crabs.

Wild and semi-domesticated fruit and nuts are in some areas a major seasonal component of people's diet: Tahitian chestnut *(Inocarpus fagifer)* on the West coast of Santo, beechnut *(Castanopsis acuminatissima)* in Trangap, "toun" fruit *(Pometia pinnata)* in the Kilimeri, Pangium nuts *(Pangium edule)* at Ikundi, and nut pandans *(Pandanus jiulianettii)* at Nokopo.

Other fruits are consumed sporadically as snacks during the day but nevertheless constitute an important part of the diet. In some areas the proportion of "bush food" in people's nutrition is high (Kilimeri, Musula) but in others, where people rely much more on gardening to cover their nutritional needs, collected food makes for a welcome variety in the diet (nutrition has been a special topic at the Santo sites, see detailed reports).

Except for some hinges, a few nails and pieces of wire, houses at Ikundi are built from bush materials only.

Forest resources also yield crucial materials for the construction of houses, bridges, fences, traps, implements and tools, and above all firewood. A certain proportion of forest plants is also used for medicines as well as narcotics and intoxicants. Useful trees are sometimes extracted in the wild but in many cases they are carefully tended in semi-cultivation (arboriculture). To an outsider, Melanesian forests may look like wilderness but for their guardians they are a carefully managed resource (see detailed reports on Vanimo-Kilimeri and on Ikundi).

However, for Melanesians the forest is not only a resource area for the extraction of useful construction materials and complementary food, but also caters for their spiritual needs. It is the place where bush- and ancestor spirits dwell and where people may contact the world beyond (see detailed report on Musula). Consequently the forest constitutes also the stage for traditional rituals.

At Trangap the traditional initiation ceremonies which were crucial for the transmission of local ecological knowledge took place in the forest.

And last, but not least, the forest is also the place where people seek voluntary social isolation (Ikundi, Nokopo).

Knowledge of forest resources is vital for the people of Melanesia. For this reason APFT has contributed to the writing-up of a local ethnobotany in the Solomon Islands (see detailed report on Kwara'ae).

A collection of Sago leaf fibre skirts - Krisa (cliché S. Klappa)

House being built - Nokopo (cliché C.K.Schmid)

4. CONSERVATION, CHANGE, AND DEVELOPMENT

Policy areas: human rights and indigenous issues, conservation policy, tropical forest, environment, gender, infrastructure.

> *In the Kilimeri area there are 22 sacred sites within an area of 500 km².*
> *At Musula there are 160 sacred sites within an area of 300 km².*

Traditional forest management practices are in most cases sustainable, although they rarely include measures which are consciously directed towards conservation of forest. There are taboos on cutting certain trees, on overhunting animals or overextracting other food resources. In many places there are also sacred sites in the forest which are completely protected from human interference. However, with Christianisation and other external influences, the traditional taboos are often no longer followed and these sites thus no longer protected.

The Western concepts of "conservation" and "sustainable development" are foreign to most Melanesians.

> *"Tumbuna i no save tok long dispela samting - our ancestors did not talk about this" (a comment on "conservation" from Ikundi).*

However, "development", with the meaning of economic development, that is wage income, stores, schools, hospitals, roads etc., is enthusiastically anticipated by young and old alike. Older people, and younger people with formal education, tend to be more concerned about issues of conservation. Especially in the densely settled high altitude areas, they are worried about a shortage of arable land. In areas where there are logging operations planned or ongoing, Melanesians have become concerned about preserving parts of the forest for the use of future generations.

> *Women are in no position to challenge men's decisions on land management, because it is culturally just not acceptable to do so (Kilimeri).*

Women almost everywhere, however, are excluded from decision making on land use, from participation in development projects and from "conservation" efforts.

Important decisions are usually made by clan- or lineage elders who control the land which is held communally.

Logging and mining operations are a serious threat to the lifestyles, health and cultural identity of forest people (the impact and problems of logging are discussed in the detailed reports on Pio-Tura, Vanimo-Kilimeri and Musula, and the thematic report on industrial resource extraction). Further, Melanesians are also losing control and rights over their inherited lands in a much subtler way. By declaring the country's biodiversity to be a "global common" (Bennholdt-Thomsen 1998, 73) the "first world" has successfully claimed co-ownership of its plant and animal resources. These resources have been the sole property of the people living with and off them for hundreds and thousands of years. In many areas, conservation projects have been set up which aim at protecting the environment from its traditional owners (see detailed report on Pio-Tura).

No wonder that all over Melanesia rural people's self-esteem is low: they feel "isolated, remote, and poor" on the West coast of Santo, they describe themselves as "the last bush kanaka" at Ikundi, and are forced to lead what they call a "rubbish life" in the Kilimeri.

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APPENDIX 1

The topics of the IIED questionnair e

- Development indicators
- Local classification of forest land
- Hunting of wild animals and birds
- Harvesting of wild plants and other natural raw materials
- Other activities in areas of primary forest
- Traditional forest management
- Commercial values of the forest
- Major land use decisions
- Generational differences in attitude and practice
- Gender differences in attitude and practice
- Concepts of sustainable development
- Impact of government policy
- Incentives for conservation

APPENDIX 2 , TABLES

TABLE 1: Geographical data

Unit of investigation	*Predominant vegetation type*	*Estimated percentage of forest cover*	*Mean annual rainfall*	*Seasonality*	*Altitude range of territory*	*Temperature range*
Pio-Tura	Lowland Hill Forest (Lower Montane Forest)	99%	>6000 mm	wet with several annual drier periods	100-1500	15-32°C
Ikundi	Lowland Hill/ Lower Montane Forest (Upper Montane Forest)	99 %	3000 mm	wet with an annual dry season	500-2800	14-30 C
Trangap	Lower Montane Forest	30 %	3150 mm	wet with an irregular dry season	1500-2200	14-30 C
Musula	Lowland Hill Forest/ Lower Montane Forest	99%	>2500	wet with an irregular annual dry season	40-1400	18-33C
Nokopo	Lower Montane Forest (Upper Montane Forest)	40 %	>2500 mm	wet with an annual dry season	1200-2500	05-28 C
Kilimeri	Lowland Forest/ Lowland Hill Forest	95 %	>2500 mm	wet with an irregular annual dry season	0-800	20-35 C
West Coast Santo	Littoral Forest / Lowland Forest / Montane Forest	80 %	>4000 mm	wet with a distinct annual dry season	0-1875	20-30 C (coast, in-land much colder)

TABLE 2 : Demography

Unit of investigation	*Population*	*Population density (estimated)*	*Estimated area*
Pio-Tura	940 people	0,5 people / km^2	1950 km^2
Ikundi 1988 estimated	1.000 people	1,4 people / km^2	700 km^2
Ikundi 1998 estimated	1.100 people	1,6 people / km^2	700 km^2
Trangap	959 people	16 people / km^2	60 km^2
Musula	550 people	1,5 people / km^2	400 km^2
Nokopo 1987	250 people	10 people / km^2	25 km^2
Nokopo 1997	401 people	16 people / km^2	25 km^2
Kilimeri 1990 National Census	2.411 people	4,8 people / km^2	500 km^2
Kilimeri 1998 estimated	3.500 people	7.0 people / km^2	500 km^2
Krisa 1998	600 people	4 people / km^2	150 km^2
West Coast Santo (Tasmate, Elia, Kerepua, Wusi and Linturi villages)	419 people	1,4 people/km^2	300 km^2

TABLE 3 :Access to towns measured in travelling time (in hours)

Community / unit of investigation	*Hours by walking*	*Hours by car or boat*	*Hours by plane*
Pio-Tura	110 -150 *	-	0.75
Ikundi	14 - 26 **	-	-
Trangap	120	-	0.75
Musula	-	70 (boat)	1
Nokopo	100	-	4 ***
Kilimeri: Isi	8	1.5	-
Kilimeri: Krisa	4-6	1-1.5	-
West Coast Santo	12-24	5 - 48	-

* ***110 hours to Bamuru (including boat travel), 150 hours to Goroka***

** ***14 hours to the government station at Menyama, another 12 hours to Lae***

*** ***includes actual travelling time by plane and walking time to airstrip***

TABLE 4 : Infrastructure and 'first' contact

Unit of investigation	*Estimated percentage of school age children attending elementary school*	*Number of university leavers*	*Persons / aidpost or health centre*	*"first" contact*
Pio-Tura	10%	-	940	1957 (1893 southern fringe, 1936 northern fringe)
Ikundi	<1%	-	-	1953
Trangap	30%	3	959 (but with three staff)	1938 (occasional) 1962 (regular)
Musula	90%	-	550	1960 for the southern clans
Nokopo	50%	-	400 (1987) 600 (1997)	1928
Kilimeri	30%	-	700	after 1910 (coast: 1827)
Krisa	95%	1	600	after 1910 (coast: 1827)
West Coast Santo	90-98%	2	140	about 1850 (Big Bay, North Santo: 1606)

TABLE 5 : Average annual cash income per household

Unit of investigation	*Average annual income in PNGKina / Vatu*	*Average annual income in Euro*
Pio-Tura	720	285
Ikundi	0-100	0-40
Trangap	200 - 1.000	80-400
Musula	50 - 500	20-200
Nokopo 1987	100 - 200	40-80
Kilimeri: Isi (logging ongoing)	500 - 20.000	200-8.000
Kilimeri: Krisa (logging terminated)	500	200
West Coast Santo	30.000 – 70.000 Vatu	215-500

TABLE 6 : Main cash generating activities (in order of importance)

Unit of investigation	*1st*	*2nd*	*3rd*
Pio-Tura	bride wealth	sale of game (meat, fur, young animals)	sporadic wage employment by scientists
Ikundi	sale of bark cloth	incipient coffee cash cropping	sporadic wage employment by scientists (and formerly airstrip building in neighbouring valleys)
Trangap	vegetables cash cropping	remittances of relatives with wage employment	occasional wage employment (government)
Musula	dividends from share held by landowner company	employment in the divers company (logging or petrol survey)	market sale of pork
Nokopo	coffee cash cropping	market sale of garden surplus	sale of pork
Kilimeri: Isi (logging ongoing)	timber royalties and levies	temporary wage employment (logging company)	cocoa cash cropping
Kilimeri: Krisa (logging terminated)	remittances of relatives with wage employment	dividends from share held by landowner company	market sale of sago starch and garden surplus
West Coast Santo: Elia	copra cash cropping	cocoa cash cropping sale of sandalwood	sale of kava (*Piper methysticum*)
West Coast Santo Wusi	copra cash cropping	sale of sandalwood	Sale of artefacts to tourists (mainly in town)

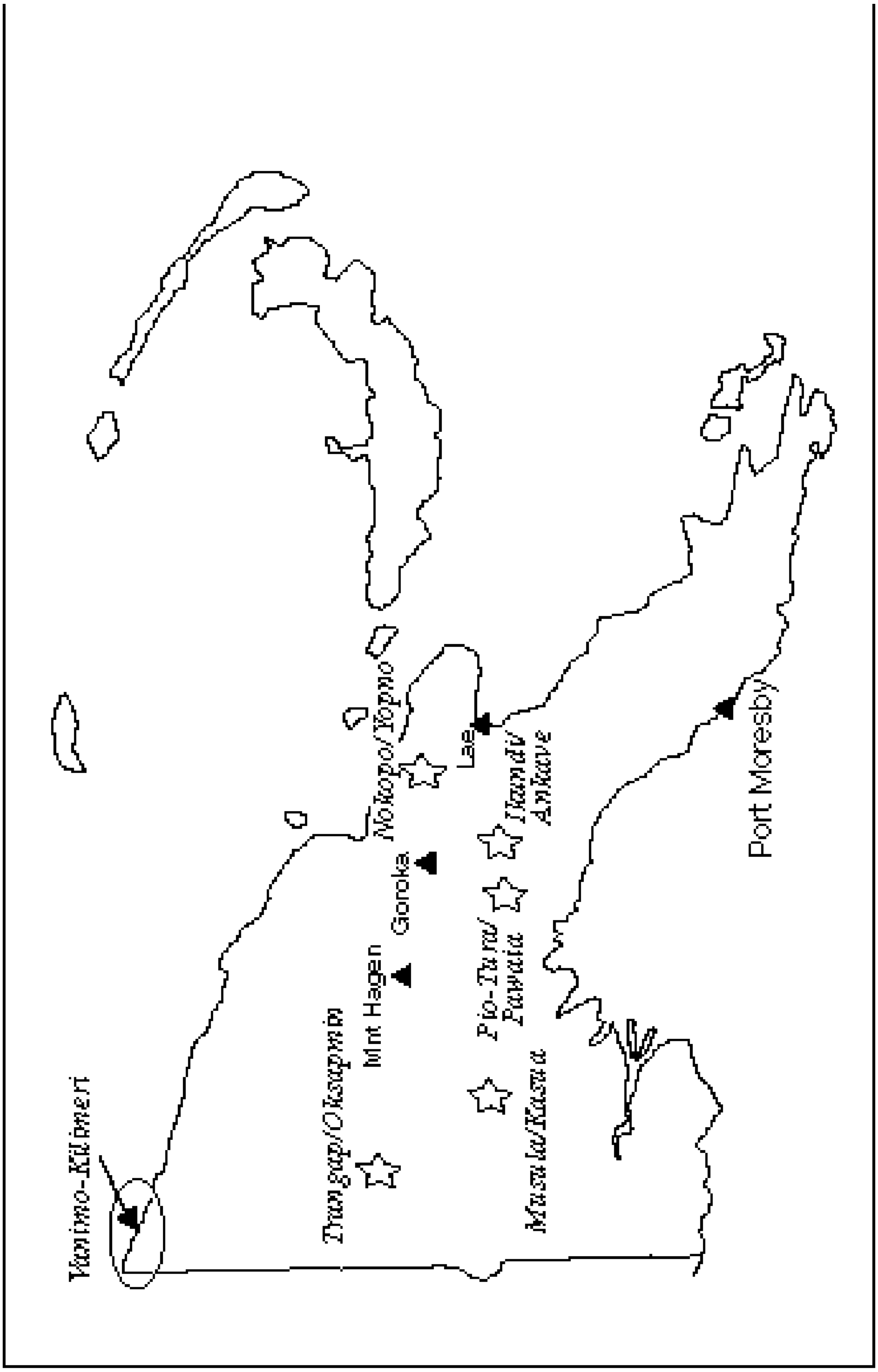
TABLE 7 : Main subsistence foods in order of importance

Unit of investigation	*1st*	*2nd*	*3rd*
Pio-Tura	sago	sweet potato	cultivated greens ('aibika')
Ikundi	Xanthosoma taro	banana and cultivated greens ('aibika')	sweet potato
Trangap	sweet potato	Colocasia taro	banana
Musula	sago	various forest foods	banana
Nokopo	sweet potato	banana	various garden produce
Kilimeri: Isi	sago	banana and semi-cultivated greens	various collected bush foods
Kilimeri: Krisa	sago	coconut and semi-cultivated greens	banana and cultivated greens
West Coast Santo: Elia	Colocasia taro	yam, banana, Xanthosoma taro, breadfruit	manioc
West Coast Santo: Wusi	yam	manioc	taro

TABLE 8 : Recorded numbers of harvested wild plant food

Investigation unit	*Number of plants used for food*	*Number of plants hosting edible insects*	*Number of plants known to attract game / birds and used by hunters to lie in wait at*
Pio-Tura	>50	About 10	About 25
Ikundi	91	About 10	About 25
Trangap	>100	>50	>50
Musula	122	86	82
Nokopo	37	11	32
Kilimeri: Isi	52	79	14
Kilimeri: Krisa	>50	About 10	About 10
West Coast Santo	>100	>10	About 20

II
PAPUA NEW GUINEA



Research sites in Papua New Guinea

SITE OF INTENSIVE INTERDISCIPLINARY RESEARCH (SSIR)

PAWAIA PEOPLE OF THE PIO-TURA REGION, PAPUA NEW GUINEA

SITE INTENSIF PLURIDISCIPLINAIRE (SIP)

David M.ELLIS
FUTURE OF RAINFOREST PEOPLES (FRP)
PAPUA NEW GUINEA (PNG) WORKING GROUP

WITH MEMBERS OF THE FUTURE OF THE RAINFOREST PEOPLE (FRP)

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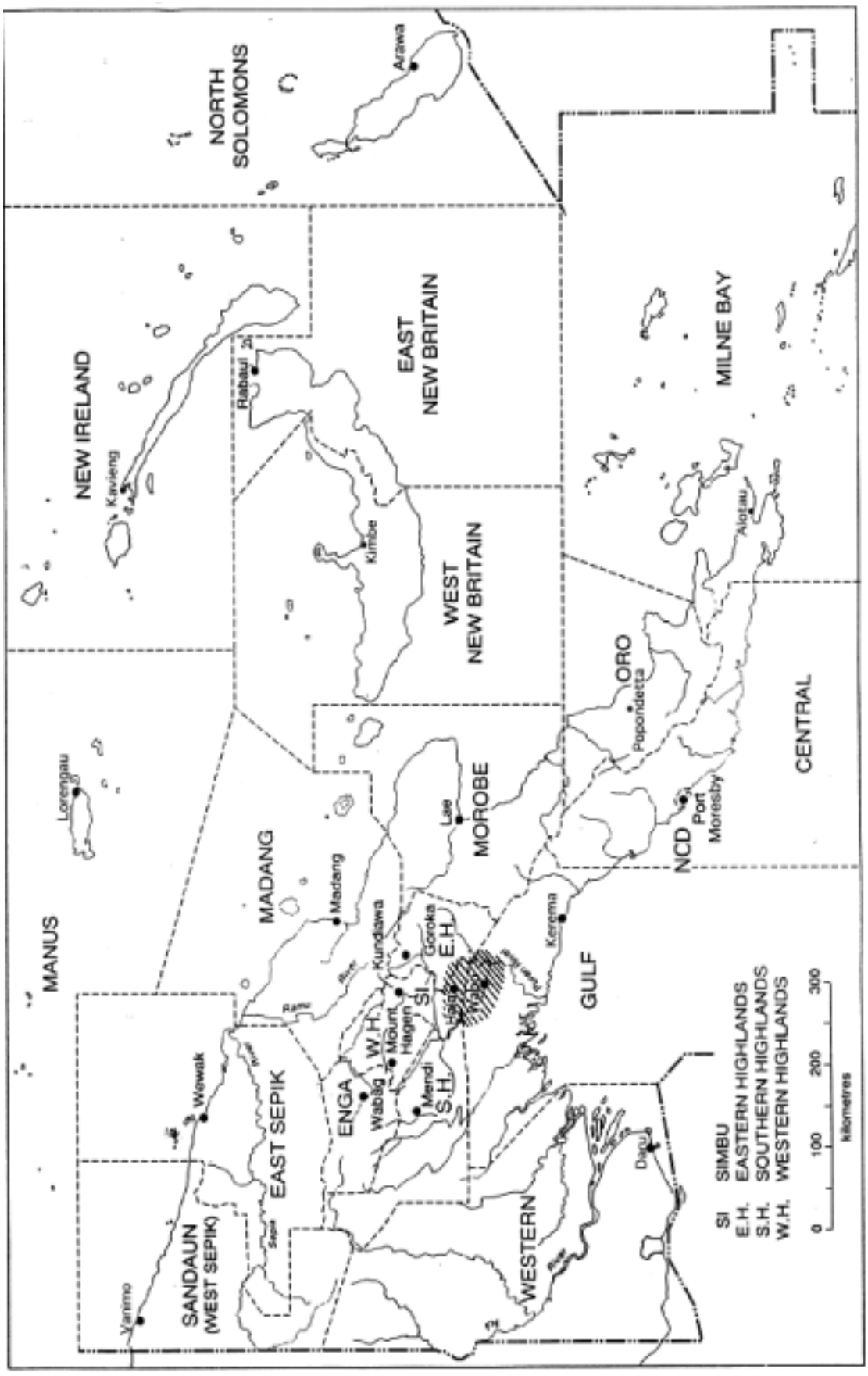


Location of Pawaia territories within Papua New Guinea

INTRODUCTION

This report focuses on the key themes in development and conservation arising from research with Pawaia people in the Pio-Tura region of Papua New Guinea. A 'problem solving' approach is adopted. There are six sections and each is structured in the following way:

- the 'problem' or key points are outlined;
- primary and secondary EC policy areas to which the section is relevant are highlighted;
- a case study is presented;
- recommendations are made with EC development policy and projects in mind.

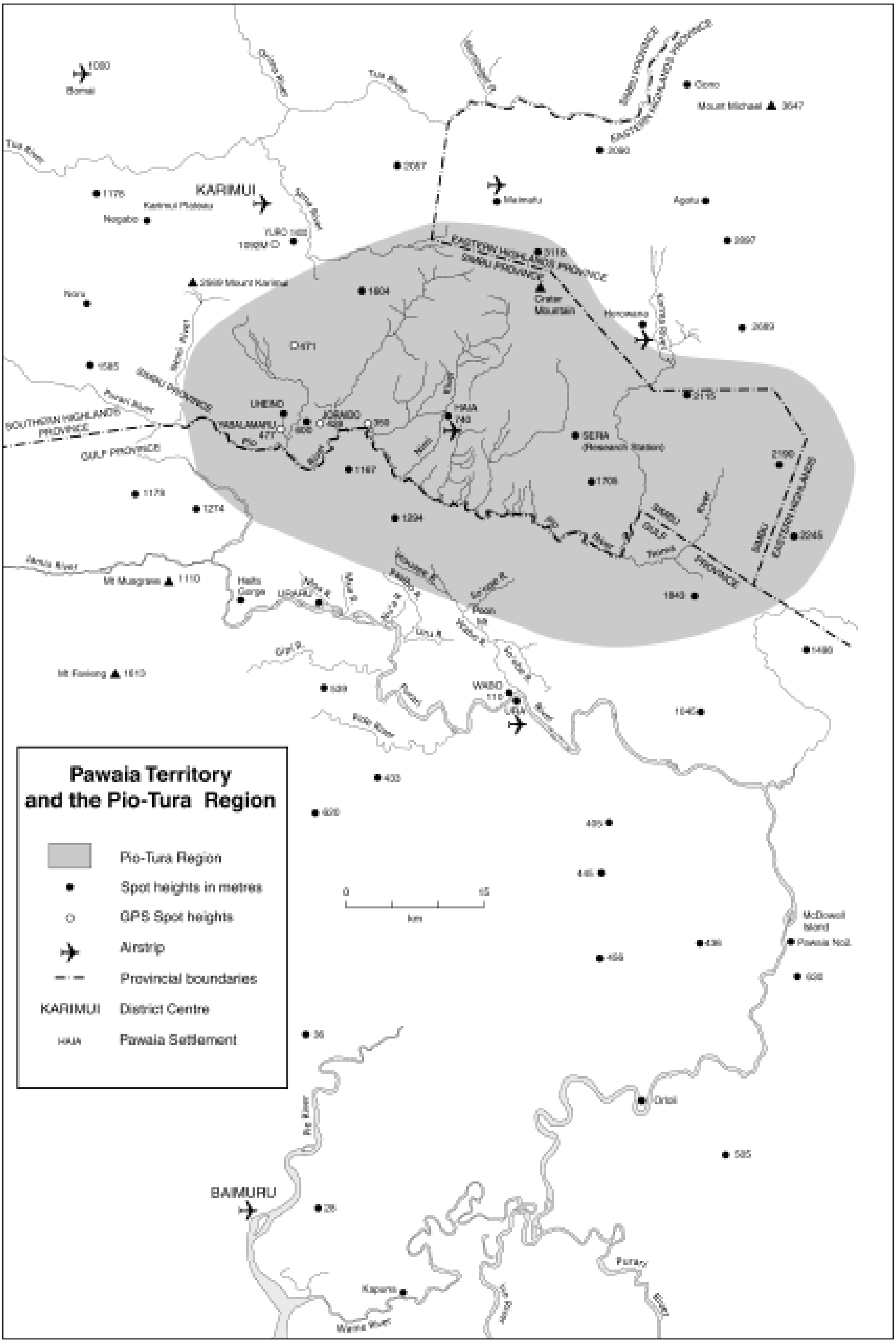
The Pio-Tura region was proposed by staff of the National Research Institute of Papua New Guinea as a site where research could be carried out through the Future of Rainforest Peoples Programme. This was due to the status of the region as a protected area and the fact that it is on the periphery of negotiations for industrial logging. In addition, there was no pre-existing detailed ethnography concerning Pawaia people who live there.

The principal aims of research with Pawaia people in this area are:

- to make an assessment of the livelihood of local people, with a particular focus on human ecology and ethnography in a diachronic perspective.
- to review representations of Pawaia people by those who came to their land from outside throughout recorded history.
- to document local concerns about development and perceptions of development and change.
- to record the social impact of logging negotiations and their effects.
- to make an evaluation of the Crater Mountain conservation project and its impact on local people, and to make recommendations for the integration of human concerns into the methodology and practice of conservation programmes in general.

This report reflects these objectives while focusing on themes of relevance to EC policy areas. A section on 'eco-forestry'is included, as this is currently a particular focus of the European Union development budget in Papua New Guinea. The emphasis is on local perspectives, and the speech of local people is quoted in italics. The report concludes with references and a targeted bibliography relevant to the themes and policy areas discussed.

This is a highly selective presentation of extensive anthropological research conducted in the Pio-Tura region. It is aimed at making some of the information produced as useful as possible for EC functionaries and policy makers.


Pawaia Territory
and the Pio-Tura Region
Pio-Tura Region
Spot heights in metres
GPS Spot heights
Airstrip
Provincial boundaries
KARIMUI
District Centre
Pawaia Settlement
KARIMUI
BAIMURU
SOUTHERN HIGHLANDS PROVINCE
GULF PROVINCE
EASTERN HIGHLANDS PROVINCE
SIMBU PROVINCE
km

1. REPRESENT ATIONS AND MISREPRESENT ATIONS OF RAINFOREST LIVES

KEY POINTS

- People in rainforest areas have a social and cultural history which pre-dates the recent history of development and conservation projects.
- Local histories are often misrepresented or ignored in development and conservation. Not only is this detrimental to project success; it also tends to lead to confusion and low self esteem amongst local people.
- Sustainable development in rainforest areas cannot work unless policy makers and project staff attempt to become informed about forest peoples in general and about social history in particular areas and then integrate people's concerns into policy and projects.
- Anthropologists are ideally placed to facilitate this process.

RELEVANT POLICY AREAS

(primary): human rights and indigenous issues; education; cultural development; conservation policy; tropical forests; decentralised co-operation; health; environment.

(secondary): poverty reduction; gender; Non-Governmental Organisations (NGOs).

CASE STUDY :

In this case study, a profile of Pawaia subsistence and people is contrasted with an account of how local people have been represented by outsiders in recent history.

PROFILE OF P AWAIA PEOPLE AND SUBSISTENCE

- Population and population density: About 940 Pawaia people are based in the Pio-Tura region. Estimated population density is 0.5 people per square kilometre.

"Our main concerns are food and children. Then looking after pigs, dogs and chickens. We work all the time because we always have work to do. Our ancestors gave us work to do, so we have to work all the time" - Pawaia woman in her 40s, 1999

- Subsistence activities: sago cultivation and production; swidden gardening; cultivation of yielding trees and palms; pig husbandry; hunting and trapping of wild animals and birds; fishing in rivers and small lakes; collection of wild foods and materials in the forest.
- Mobility is a key characteristic of Pawaia subsistence and culture. The variety of subsistence activities, combined with social factors of land and resource tenure and the seasonality of harvests from crops, gathering and hunting all influence the mobility of people across the land. Prior to the 1970's, conflicts between groups were a further factor influencing movement across the land.
- Mobility is also fundamental to social relationships. One of the reasons why men move through the forest is to serve the family of their prospective or actual wives - either with their labour on the lands of the wife's family, or by hunting and delivering meat procured from their own lands. Thus, what we refer to in English as 'bride price'is not merely a transaction between two families when a man takes his wife, although exchanges do occur on this occasion; it is a rather a long-term relationship of exchange between social groups and networks of kin.
- There are different levels of social organisation. There are two principal levels of group membership within Pawaia ethnicity – larger groups, and smaller divisions within these groups (see Fig.1). There does not appear to be a specific collective term in the vernacular for the larger groups, other than the general word 'people' [tee], though each has its own name. The smaller groups, in addition to their own names, do have a collective term - [ja]. It seems to be at this level that land has been divided and collective rights have arisen. According to local laws, important decisions were made customarily with the consensus of all members of these smaller groups.
- It is advisable not to use the word 'clan': its meaning and definition are as ambiguous in English as in Tok Pisin (the lingua franca of Papua New Guinea), and it is generally a misleading term when talking about Pawaia sociality and land and resource use. When Pawaia people respond to others speaking in Tok Pisin, they often use the term 'klan' interchangeably to refer to both levels of group. Outsiders who might have no knowledge of Pawaia history and custom can have no means of knowing which level of social organisation is being referred to if they use the term 'clan'.

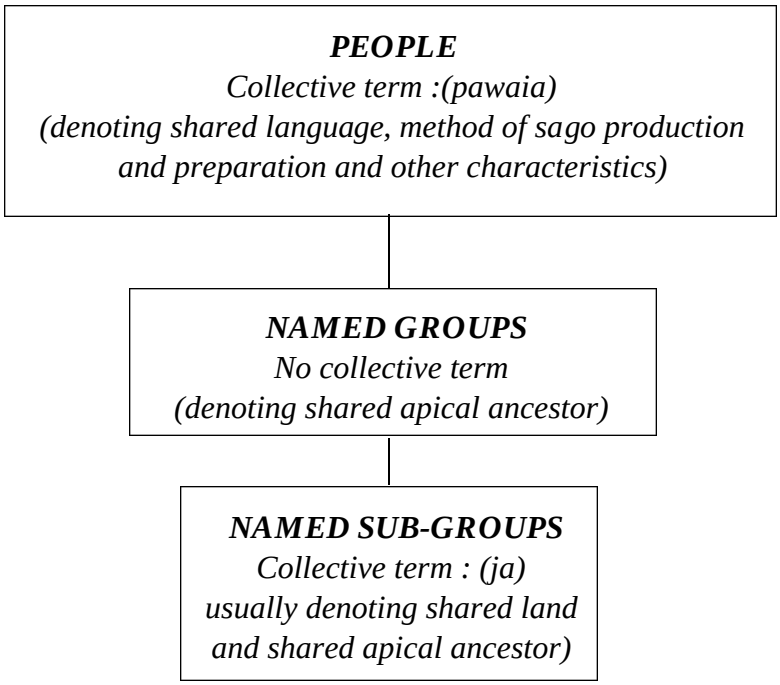


Fig. 1: Levels of social organisation for Pawaia people.

All social groups have relations of shared land and common ancestors. There are many groups and sub-groups. Some of the groups have up to seven sub-groups; others have two. This diagram highlights different levels of grouping in relation to subsistence, language, land and ancestors.

DRAWING BOUNDARIES WITHOUT LOCAL KNOWLEDGE

- Administrative boundaries and poor access to services: The borders of three national Provinces cut across Pawaia lands (see map of Pawaia Territory and the Pio-Tura Region). This means that questions of government services such as health, education and the court system, must be addressed in 3 different directions. Pawaia people are seen to be at the margin of each administrative region. They are last on the list for education, health and agricultural services.
- Extractive development - respecting no boundaries: People in areas such as this are potential prey for unscrupulous development – logging companies can emphasise the neglect of people by government and make promises in order to attract support.
- Anthropological boundaries: No detailed long term anthropological research had been carried out with Pawaia people prior to 1996. This means that they are often in a position of perceived marginality even within certain existing anthropological

works – they are 'off the edge' of other ethnographies (e.g. Wagner 1967, Hide 1984). If we apply typologies of 'culture area' to people of the Pio-Tura region, we find that only categories depicting various states of marginality to external cores of influence apply: 'highland fringe', 'mid-altitude fringe' (Hyndman and Morren 1990), 'Mountain Papuan' (Weiner 1988). The common depiction of Pawaia people as 'semi-nomadic' is also vague and ill defined. It depicts a random movement across land and perpetuates an image of Pawaia people as being mysterious.

- The boundaries of conservation: The label of 'semi-nomadism' has been applied by conservation biologists to present people as being difficult to communicate with (e.g. Johnson 1997:420). Local people and the Pio-Tura region are often depicted as being remote, isolated, backward and without education, and people's activities are generally considered to be a threat to biodiversity.
- All these assumptions are based on a failure to engage with local knowledge and perspectives.

RECOMMEND ATIONS

- In order to prevent misrepresentations of local people in forest areas, and even violations of their rights, there needs to be more involvement of social scientists in development and conservation projects who are trained in researching subsistence and cultural practices.
- Social information should be used as a basis for any discussion of development which involves external partners. This should be gathered by local people and social scientists who are independent from incoming practitioners of development and conservation. It should take local histories into account.

2. CONCERNS ABOUT HEALTH, EDUCATION AND DEVELOPMENT : THE ADVANCES OF SOCIAL EXCLUSION

KEY POINTS

- *National infrastructure in health and education is inaccessible to many people in rainforest areas.*
- *This disempowers local people, as they often feel inferior and marginal within an outside world – they are disadvantaged in terms of information and basic human rights and they are not equipped to represent themselves, either within the nation state or in relation to outside forces, such as global capitalism or industrial logging.*
- *'Contact' with global economic forces in rainforest areas and the resulting rapid change and general lowering of people's self esteem contribute to a breakdown in local communication, including inter-generational transmission of knowledge about culture and subsistence.*

RELEVANT POLICY AREAS

(primary): health; education and literacy; transport; human rights, indigenous issues; gender; poverty reduction.

(secondary) : environment, NGOs, culture, tropical forests, infrastructure.

CASE STUDY :

Infrastructure and de velopment in Haia village and the Pio-Tura region

Haia village is a centre for infrastructure and rural development in the Pio-Tura area. About 750 of the 940 people of the region have a base there, though about 200-300 is the maximum number of people who might be seen at any one time.

"The government does not help us. We don't have clothes. We don't have education," - Pawaia man in his 60s, 1998

The following ‘developments’ at Haia have attracted people to build houses there, though many of them (with the exception of the mission) are often un-operational:

- the New Tribes mission, established in 1973;
- an airstrip, completed by manual labour in 1975;
- a government agricultural extension office, opened in 1988, now closed;
- a government run medical aid post, established in 1989, upgraded to the status of a ‘health sub-centre’ in 1990, still operating in an irregular fashion;
- a community school opened in 1991, which rarely operates at all; and
- a water supply installed in 1994 through the beneficence of a provincial politician.

Haia can be accessed by small aircraft, but there are no roads and walking is the main means of transport. Parts of the region are at least three days’ walk from Haia. Women with difficulties in pregnancy and other medical emergencies require evacuation by air from Haia to the nearest town of Goroka. There are rarely external funds available for this and people have very little cash to cover such costs.

There have been no High School graduates for the entire region, no university students and no local people trained in professions such as teaching, law, accountancy, politics, business or, for that matter, anthropology. 19 students passed Grade 6 at the community primary school in 1997 during a rare year where the school remained open (only for the older students). One man has managed to qualify as a community health worker, though he has found it impossible to be accepted in a paid position to work amongst his own people.

Some tuition in literacy in the vernacular has been made available through the mission. The literacy rate in the lingua franca, Tok Pisin, is estimated as 5%, almost exclusively amongst young males, and this is far lower in English, the language of national education.

Although there is a primary school and a small health centre, staff appointed to the posts rarely arrive in Haia village. Those who do come to the area are often corrupt and embezzle money from local people; those who never arrive often draw a salary without doing the work. Government services in the Pio-Tura region are provided through Simbu Province, which is predominantly far more heavily populated and at higher altitudes than the Pio-Tura region. Staff who arrive invariably have different subsistence and cultural practices to Pawaia people and find it very difficult to adapt to a markedly different culture area. This situation often demotivates local people and makes them feel that their land and people are inferior within the nation of Papua New Guinea.

The provisioning of government services is linked to population size. When people discuss the un-operational state of services across the Pio-Tura region, a common conclusion is that the population must grow in order for people of the region to procure more services and greater influence at a national level. This perception conflicts with the

externally promoted discourse of conservation in the region, which encourages that human population remains low.

One aspect of the work of the Future of Rainforest Peoples programme has been to document people's development concerns – both in the centres of influence (including Haia, where the main infrastructure and services are based), and in other parts of the region which are only accessible by foot. The following is the assessment of two individuals from the area, one man and one woman:

Options for de velopment?

"We want to plant coffee but we think that it will be very hard to sell it here. How could we do it? How would we send it out from here? The people of Yabalamaru, Uheino and Joraido are thinking of making an airstrip. It would not be too much work. We could dig up the roots of the trees. Coffee grows well here. They have planted well at Yabalamaru and Uheino now. Coffee is the best way to make money.

Our second concern is for health. We need a doctor. We want to get a health centre - build it and put people there to work in it. It is very hard for these three communities. Our children die and our numbers go down, so we need a health centre.

We want to start a school in the vernacular… We need exercise books and pencils and chalk. …We have already taken the names of 25 children and 15 adults, men and women. Then these children will feed into the community schools in Haia and Karimui to start their national education," – Pawaia man in his 30s, 1998.

"Later on our lives and our place must change and we must be happy. … [We need] education [and] health services. We really want doctors and teachers. If teachers do not teach our children, where will they learn? … The third concern is to do business, so that the children who go to school can pay for their school fees," - Pawaia woman in her 20s, 1999.

Earth oven (cliché C.K. Schmid)

RECOMMEND ATIONS

- People who live in rainforest areas must have access to the basic services in health and education which they themselves identify as unmet needs. The disparity between urban and rural areas must be addressed. This could be achieved in the following ways:
- Capacity building within government departments at both national and provincial levels to promote the perspectives of people in a marginal position within the nation state and to ensure that areas perceived as 'remote' are served as well as urban constituencies with health and education services. Social scientists should be employed in this process.
- Work in closer partnership with human rights and appropriate technology NGOs which focus on meeting health and education needs for men, women and children in rural areas. Develop programmes in areas of distinct government weakness. For example, if teachers expected to work in more remote places are not given additional allowances for travel to and from their home area, there is little incentive for them to stay. Support programmes could be developed with government and NGOs which provide additional benefits in such cases, such as travel allowances and high quality sustainable housing with solar power and water supply. Renovating school buildings and improving teaching supplies would also be support activities which might help to provide incentives and motivate teachers to stay in such areas and do a good job.
- Work in a support role to curriculum units within education departments to promote local knowledge in the national education system. Local knowledge about the environment or culture is often perceived as having little worth in comparison to knowledge gained through the national education system. There is a need for greater integration of the two. This could be achieved by making provision within school timetables for the discussion and transmission of local knowledge, perhaps from senior individuals in each community.
- 'Traditional' medical knowledge is another theme which could be promoted within the school curriculum. Western medical practices are often seen to supersede and make redundant local knowledge about health. Applied research in ethnomedicine could be conducted to document local medical practices and therapeutic plant use, to regenerate local interest in such knowledge and to forge a partnership between 'traditional' and 'scientific' medical knowledge.

3. THE IMPOR TANCE OF LOCAL PERCEPTIONS OF DEVELOPMENT

KEY POINTS

- *Local discourses about the recent past, the present and the future are often framed in terms of development.*
- *Development can sometimes become appropriated into a mythical framework of local cosmology to create a specific local knowledge of an industrial world.*
- *There is a need to approach an understanding of local perceptions of development and change for any project to be a success.*

RELEVANT POLICY AREAS

(primary): human rights and indigenous issues; environment; conservation policy; tropical forests; decentralised co-operation; cultural development; trade; infrastructure, transport, mining.

(secondary): poverty reduction; education; health; gender; NGOs.

CASE STUDY :

One of the methods employed in research in the Pio-Tura region has been the participation in discussions and meetings and the recording of speech about development over an extended period. The following account depicts one stage in the local discourse about oil extraction being carried out on a neighbouring people's land. It is important to note how rumours about development projects can become incorporated into a mythical way of thinking which might be markedly different from the conceptual reality of developers. A failure to recognise this can have serious repercussions for development and conservation projects.

Oil, snakes and the futur e

"A white man went diving in the lake over the other side of the mountain … Using goggles he saw a snake with seven heads beneath a stone. A woman sat on the snake holding a letter which the white man read. It said 'If you kill me a thousand men will die'. Oil is said to lie beneath this snake. A company will come to discover the oil and men will be hired for big work which will last for 50 years. They will be paid 170 Kina per fortnight and will be hired from Haia, Wabo, Karimui, Maimafu ... I am thinking of going too but if the snake is going to be killed then I will come back.

Maybe a thousand people will die but the next generation will have plenty of money. They say that we can leave our homes and gardens too - I think there will be new houses and gardens waiting,".

Pawaia man in his 20s, 1997

36 men signed a paper saying that they would go immediately when the company came to take them in a helicopter. The paper was to remain with someone in the village every day so that he could tell the representatives from the company the names of all the people who would work. It was believed that they would soon come to take names and give the time of when the work would commence.

Variations of this story came and went every few months. The helicopter was always awaited. Sometimes, people would rush to the airstrip with some possessions when they heard a plane or a helicopter, ready to take off and do this work. Sometimes the message was said to have come by radio, other times by word of mouth. But the helicopter never came, in spite of the oil company's sporadic activities reported during the period 1996-9.

The American Peace Corps volunteers placed in the village at the time were at pains to disprove these stories. They worked with staff at the office of the conservation organisation by radio to ascertain the institutional point of view. The verdict from the capital (and from western 'scientific' knowledge) came back that the stories, "must be just rumours unless it is totally illegal and without a licence,". On behalf of the conservation organisation, the Peace Corps volunteers attempted to impose this 'rational' verdict.

RECOMMEND ATIONS

- It is important not to dismiss local perceptions of development, such as those presented here. They may be very meaningful for people. More attention must be paid to such perceptions with the broader aim of achieving a deeper understanding of social relations, culture and history – both at the policy level and within specific development and conservation projects. The history of contact with outside influence, and the contribution of each proposed project to this process, must be evaluated in advance.
- Practitioners of conservation and development should consider power differentials and inequalities at play in flows of information in the projects they administer in rural areas. While large quantities of information flow out of rainforest communities in development and research projects, relatively little information about the world beyond the bounds of the forest flows in. There is a local need for information about the industrial world in rainforest areas. Such information would ideally be disseminated over a long period of time through the education system, if that system were functional. Yet national education must also take into account local perceptions and ways of thinking and not just ways of the 'town'.
- There is also a need for human rights NGOs to work in rainforest areas to inform people of their rights, such as the status of customary land tenure within national law, how logging works, how mining works, what government services they are entitled to, which things they should take care of themselves, and so on.
- The case presented involves mythical perceptions about development, but people also have practical knowledge of what might work and what might not at the project level – the importance of indigenous knowledge in development must be valued. By 'indigenous knowledge', not only knowledge of the plant world is inferred, but also an intimate knowledge of culture and local history.

4. A SOCIAL EV ALUATION OF CONSER VATION POLICY AND PRACTICE

KEY POINTS

- *Practices of so called 'community based'conservation have not taken heed of local culture, history, human ecology and subsistence needs.*
- *There have been few attempts to understand what conservation might mean in a local context. There may or may not be sustainable local practices which are contingent with the essentially western notion of conservation.*
- *In models of conservation, the beneficiary is always biodiversity, not local people.*
- *There is poor communication, under-representation and even misrepresentation of local people in conservation activities conducted on their lands by NGOs.*
- *'Integrated Conservation and Development' methods impose capitalist structures, based on the plans of donors rather than on local concerns.*
- *This all alienates people, not only from conservation projects but also from each other.*

RELEVANT POLICY AREAS

(primary): conservation policy; tropical forests; environment; human rights and indigenous issues; education; decentralised co-operation…

(secondary): poverty reduction; gender; health; cultural development, NGOs…

CASE STUDY :

Two contrasting views of conservation are presented here. The first comprises some quotations from conservation practitioners working for NGOs in Papua New Guinea, and the second is a statement made by a senior Pawaia man.

What conservation pr actitioner s said about people who live in f orest areas

"It is a dilemma that the highest biodiversity is found where the world's poorest people are".

"Landowners don't give a damn about conservation. They don't think long-term; they only think short-term".

"Those people… have no knowledge".

"We want to increase their monetary income".

Conservation biologists speaking at the Integrated Conservation and Development Practitioners Conference, Motupore Island, Papua New Guinea, September 1997.

A local view of conservation

"[The conservation organisation] did not teach us how to look after our forest. We have rules which forbid people from the larger groups… using the land of [other groups]… And within these larger groups there are smaller ones. If the members of a smaller group say that it is forbidden to hunt on their land, then no one can go and hunt there. Another example is how we dam rivers to catch fish. If all the members of the smaller landholding group give the go ahead, only then can the river be dammed. The way we look after our forest and land is crucially important. We can never go and just catch animals. It is strictly forbidden to cut open galip nuts from the tree of another man. Members of one small group cannot go and use the land of another small group. They have no rights to harvest wild eggs or kill pigs or marsupials on the land of others. We held this knowledge and practised these measures long before the wildlife people came to our lands. They just came and pushed their ideas on top of what we already knew. When they told us about their own knowledge [of conservation], we said, "We know,","

Pawaia man in his 50s, 1998.

Eating pork - a rare treat (cliché C.KSchmid)

RECOMMEND ATIONS

- A social evaluation of conservation area design and management and its impact on local people in rainforest areas must be made by social scientists.

It has been recognised nationally in Papua New Guinea that a social experiment in 'Integrated Conser vation and De velopment' is under w ay without consultation of anthropological expertise . A study of conser vation area design and management by anthr opologists acr oss Melanesia is curr ently being co-ordinated by the National Research Institute in Papua New Guinea and this is being supported by funds from the Future of Rainforest Peoples pr ogramme .

- Ideally, a social impact assessment should be carried out at the feasibility or pre-proposal stage of each conservation project. This has generally not been done in Papua New Guinea, so a review of retrospective and current practices is required.
- Anthropology has a lot to offer local people and conservation practitioners and can help mediate between the two groups. This process should be supported through action research, consultancy to conservation projects and workshops to achieve the necessary balance between critique, recommendations and partnership with conservation NGOs.

5. PEOPLE AND 'ECO-FORESTRY': ATTRACTIONS AND DRAWBACKS IN RAINFOREST AREAS

KEY POINTS

- *Portable sawmilling (also known as 'community forestry', 'eco-forestry', 'small scale timber harvesting' and 'wokabaut somil' in Tok Pisin) has been presented as an option for rural community development in an attempt to combine income generation with conservation 'management'.*
- *It is hoped that this will deter local people from signing contracts for large scale industrial logging.*
- *The basic principle is that local people use chainsaw or other portable sawmilling equipment to fell trees and process timber on site, and that this adds value to the product which would otherwise go overseas in the form of unprocessed logs and create labour for processing industries there.*
- *Portable sawmilling operations are particularly problematic in rural areas, due to high operating and transport costs. The added value may not go to the local people who do the work.*
- *Project proposals for portable sawmilling do not engage adequately with local people and their subsistence and cultural needs.*

RELEVANT POLICY AREAS

(primary): environment; conservation policy; tropical forests; decentralised co-operation; trade; infrastructure, transport…

(secondary): poverty reduction; education; health; human rights and indigenous issues; gender; cultural development, NGOs…

CASE STUDY :

Portable sawmills and conservation: false expectations?

A man from the United States visited the Pio-Tura region in 1998 through the conservation organisation working there. He had been asked by conservation practitioners in Papua New Guinea and the States to conduct a feasibility study about the 'economic values' of the forest and the potential for portable sawmilling. He held a public meeting about the merits of portable sawmilling. Although he presented a comprehensive development programme to Pawaia people, he never returned or communicated with them again. Staff of the conservation organisation ceased to promote portable sawmilling

as problems became apparent concerning both its viability and sustainability and also because the sawmilling 'expert' had made so many promises which caused high expectations and confusion locally.

One senior Pawaia man reported:

"[A man] came and said,

"I will work like a big company that cuts trees. I will help you out with a helicopter. I will come and study first. Then later on you will see some money. We will buy a portable sawmill and I will work with you and some landowners,".

If you don't know something yet, you shouldn't talk about it. This kind of way of dealing with things makes us sick. Scientists come and steal knowledge. They mess people around. They treat us like children. But we are men," - Pawaia man in his 50s, 1998.

This highlights both the inherent problems of portable sawmilling in 'remote'areas and also the desire for control and the incoherence of conservation policy when a conservation organisation first encourages one kind of development and then decides against it. Ironically, local interest in portable sawmilling was fuelled by the conservation organisation as part of its scheme to promote income generation in accordance with its 'Integrated Conservation and Development' methodology. A number of influential men in the community are now determined to get a portable sawmill.

The challenges of portable sawmills in rural development

- Portable sawmilling is often presented as a cash generating activity, yet it is financially unviable in most rural areas where there is no infrastructure to transport the machinery and timber. In many rural areas, air is the only means of transport. Air freight charges are exorbitant and the impact of air traffic upon the environment should also be considered.

It might therefore be an option for restricted community development only, for local use. Yet people are often sold the idea on different pretences.

"The best thing is for a community to get one and use it for themselves first, rather than look at other options, such as export,"

Community development worker, 1998

- Rural areas with no transport infrastructure are usually mountainous and it can be difficult and dangerous to carry the sawmill and timber manually.
- The lack of health services in rural areas makes portable sawmilling equipment

more dangerous in the event of accidents.

- Machinery is likely to break down, parts are difficult to get from outside and there is a serious risk that the equipment will be left to rust.
- Who owns the sawmill? Sawmilling can lead to local disputes over ownership of land, trees, equipment and the final sawn product.
- Sawmilling can promote a capitalist ethic which alienates people from 'resources' and encourages a mentality of selling resources for money.
- It often requires so much supervision that it becomes a completely top-down option, as local people become dependent on outside subsidies and assistance in order for the venture to break even.
- Given all the air freight and the complete dependency on outside support, what is presented as a 'sustainable' development option might not be sustainable at all.

RECOMMEND ATIONS

- More work and research must be done to ascertain the viability of sawmilling equipment and operations in areas considered to be remote. It might be the case that sawmills in such areas are not feasible.
- More research should be done on the sustainability of portable sawmilling, both in terms of its impact on environment and in comparison with local methods of processing timber.
- Lessons should be learned from the establishment of 'Integrated Conservation and Development' projects (see section 4). The same mistakes must not be made.
- Social scientists should be involved in the process of social impact assessment.
- It should not be assumed automatically by donors or project staff that portable sawmilling is a viable option for local people, especially in rural areas. The introduction of any such operation must have clearly defined goals, and these might not include the generation of high levels of income for communities and the export of sawn timbers.

6. PROMISES OF DEVELOPMENT AND CONFUSION : THE IMPACT OF LOGGING NEGOTIATIONS ON LOCAL PEOPLE

KEY POINTS

- *Logging negotiations confuse and divide groups of people in rainforest areas.*
- *They usually defy and undermine existing decision making procedures concerning land use.*

RELEVANT POLICY AREAS

(primary): human rights and indigenous issues; environment; conservation policy; tropical forests; trade; infrastructure, transport, mining, conflict prevention…

(secondary): poverty reduction; education; health; gender; decentralised co-operation; cultural development…

CASE STUDY :

Interest from all sides

There have been three sets of logging negotiations going on across the Pio-Tura region during the period 1996-99

The first, from the south, has involved a series of unexplained payments – a logging company is paying royalties to adjacent landholders of the same ethnicity as those where land will be logged. This has caused much confusion and local people are unsure whether their land will also be logged or not.

The second, from the north-west, has comprised an attempt on behalf of a Malaysian logging company to bypass government regulations and go directly to local people. There has been much emphasis on neglected development across the region and many promises have been made to build roads and bring changes to the area. In this sense it appears to be following the classic pattern of making false promises in order to get to the timber.

The third has received provincial government support to the extent that representatives of the Forest Authority were motivated to walk through rugged terrain for 12 days to, "hear what people think," and, "if they are interested in developing their forests,".

Future of Rainforest Peoples research has enabled documentation of the process of

logging negotiations with a focus on the psychological impact on local people. One of the methods employed has been to show people pictures of industrial logging and to record their reactions. This has facilitated awareness work with local people about logging.

Two contrasting local views of logging, both of them apocalyptic, are presented here.

Against logging?

> *"I have a lot of concerns about the logging company. We do not have any people from our community who have been to school. This is like a snake without a head. The company is ready but we are not. … Land is one of the strongest connections we have. My mother gave birth to me, and my blood went down into the earth. … We are not ready ... Our forest must remain. I don't want a company to come and destroy our forest and our future and our children's lives. I have one son. I think of my children and their future. Children … find trees and vines and all kinds of things. The animals of the forest will all disperse. Pigs and cassowaries and all other animals will leave and go to other people's land. My forest will be destroyed. Only grass will grow… I'm not happy at all with it. They are digging up the earth from beneath the surface and bringing it up to the surface. And the top soil goes down, that's it. This is red earth - no food will grow there. [My people] have already signed. … On one of these large areas, the company will come and cut the trees and go. I do not want them to surpass the …river [on my land]…,"*
>
> ***Pawaia man in his 40s, 1999.***

In favour of logging?

> *"We waited for [the conservation organisation], and now we are fed up, we are going to get logging in here. …[A regional representative of the company] came here and people got 139 Kina together and gave …[him] a list of people. I look after this. …[He] took the names and money. 1997 was the first time we heard about this company. I want to find out about their work. I want to go and stay with them. Where they work in Kikori, it is not too bad. I am going to go and check whether they do good work or not and if they destroy the land. … The company wants to make timber. We will tidy up our housing and build schools and get a water supply and a highway road which will go down to Haia, Wabo, Baimuru, Moresby and Kerema. In 1996 I saw the Kikori area where a Malaysian company was working. Although landholders just gave a small area, they complained. When the logging company left, the highway became overgrown and could not be used. Kikori people did*

get electricity… I cut down trees with a chainsaw. Sometimes when I went to an area where they did not have much, I left some trees standing because I felt sorry for people. In other areas they would cut everything down. I had to give false reports that I had cut everything. Sometimes I liked this work, and other times I did not feel very happy with it. I feel really bad about the destruction of forests. I sometimes think it might be alright if we said to the company, "Build a road and we will just give you 10 metres of forest on either side. I got 160 Kina per fortnight, and the pay I took home in the end was 900 Kina,"

Pawaia man in his 30s, 1998.

RECOMMEND ATIONS

- Awareness must be raised at both local and government/policy levels through the publication of research on logging and its social impact.
- During the period of research, 1996-9, there has been a crisis in the government of the forestry industry in Papua New Guinea. Export taxes have been waived and there is a list of projects on a so called ‘fast track’ for logging. The short-term aim appears to be to boost the ailing national economy. Yet this situation is jeopardising the livelihood of people in rural areas across Papua New Guinea. It is also endangering Papua New Guinea’s constitutional pledge to sustainable development and what is considered to be ‘global heritage’ – one of the last remaining areas of intact rainforest in the world. High level diplomacy is required to reverse the onslaught on Papua New Guinea’s rainforests and their inhabitants. The European Union is in a unique position to do this, given its expertise and involvement in forestry sector projects.

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SITE OF INTENSIVE INTERDISCIPLINARY RESEARCH (SSIR)

VANIMO - KILIMERI

SITE INTENSIF PLURIDISCIPLINAIRE (SIP)

Christin KOCHER SCHMID

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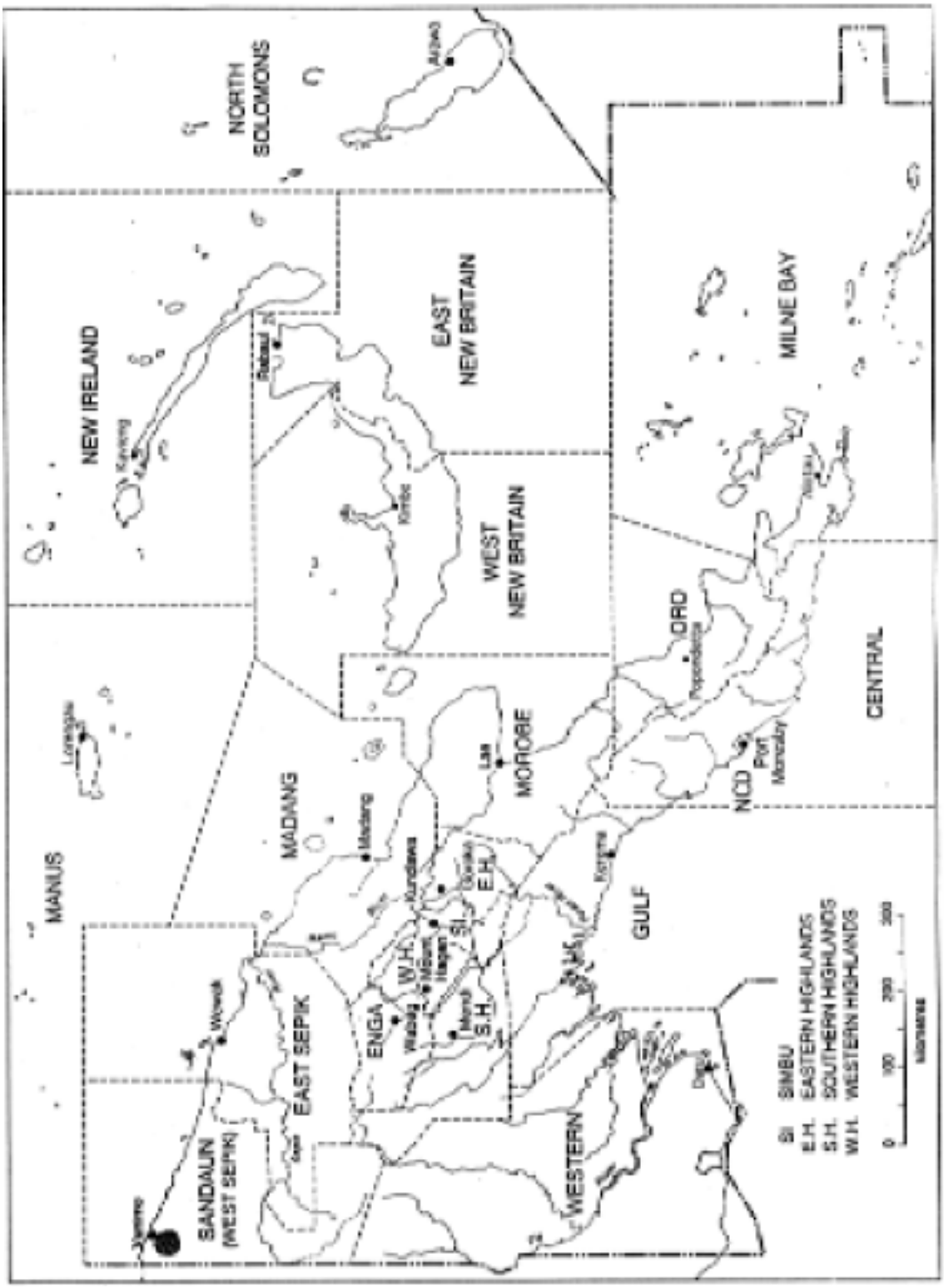


Location of Kilimeri area within Papua New Guinea

SUMMARY

Although the Kilimeri area was first contacted in the nineteenth century, first by German explorers and Malay Bird of Paradise hunters, and then by the Australian administrators, it has been a quiet backwater until the logging operations started in the mid 1980s. For many villages, access to basic schooling and health care has only been possible in recent years (Kameata, Siuta, Topni 1997). Consequently, education levels and health standards, as well as access to transnational and international flow of information, are low. This situation, combined with the increasing pace of change imposed by forces beyond local people's control, and the experience of a natural disaster in the vicinity (the tidal wave at Sissano), has caused deep uncertainity, social turmoil and emotional destabilisation. Many people expect with the turn of the millennium a violent end of the world or at least a major, outside generated and radically changed lifestyle (Kocher 1999, Kocher, Klappa 1999). The area is subject to selective logging which in contrast to clear felling has few short term disadvantages for local people, the advantages outweigh them. Our research activities have focussed on these salient and urgent issues. Investigations into general ethnography, local history and the traditional use of the environment form the basis for explorations into the impact of logging, the links and interpretations of modernity, and the expectations for the future (Kocher 2000, Klappa n.d., Kameata, Topni 1998).

A couple of logs await collection at the blasted-looking road head with shattered tree stumps and churned up soil. (cliché P. Sillitoe)

CONCLUSION AND RECOMMEND ATIONS

General characteristics and problems of the Kilimeri area:

The subsistence economy focuses on the nurture and cultivation of trees and not on gardening.

Consequently, species composition of the forest has been changed by people, who encourage useful species and suppress unwanted ones.

Incomes are low and infrastructure is underdeveloped.

Access to information and education is limited.

There is an alarming lack of future prospects.

People feel deprived and let down by the government.

The impact of logging:

The long-term impact of selective logging on tropical forest ecosystems is not well known. Moreover its effects are underestimated by local people, because they are not immediately felt.

Access to unpolluted water is severely restricted by logging operation thus putting people's health at serious risk by waterbourne disease.

A range of resources collected from the wild in the forest are crucial for the local people's well being and health: construction materials for housing and protein components of the diet. Such forest resources are destroyed by logging.

Women bear the brunt of these negative effects: it is their task to supply their families with water and collected foods while they hardly participate in the decision-making on logging and in the distribution of timber royalties.

Following selective logging, local people have established a new garden (cliché PSillitoe)

Woman processing sago (cliché P. Sillitoe)

Prevention of logging:

In the short-term logging can only be stopped when landowners receive at least the same amount of money for not selling their trees as they currently receive from the logging company. All other measures, such as landowner awareness programs, take too long to be effective.

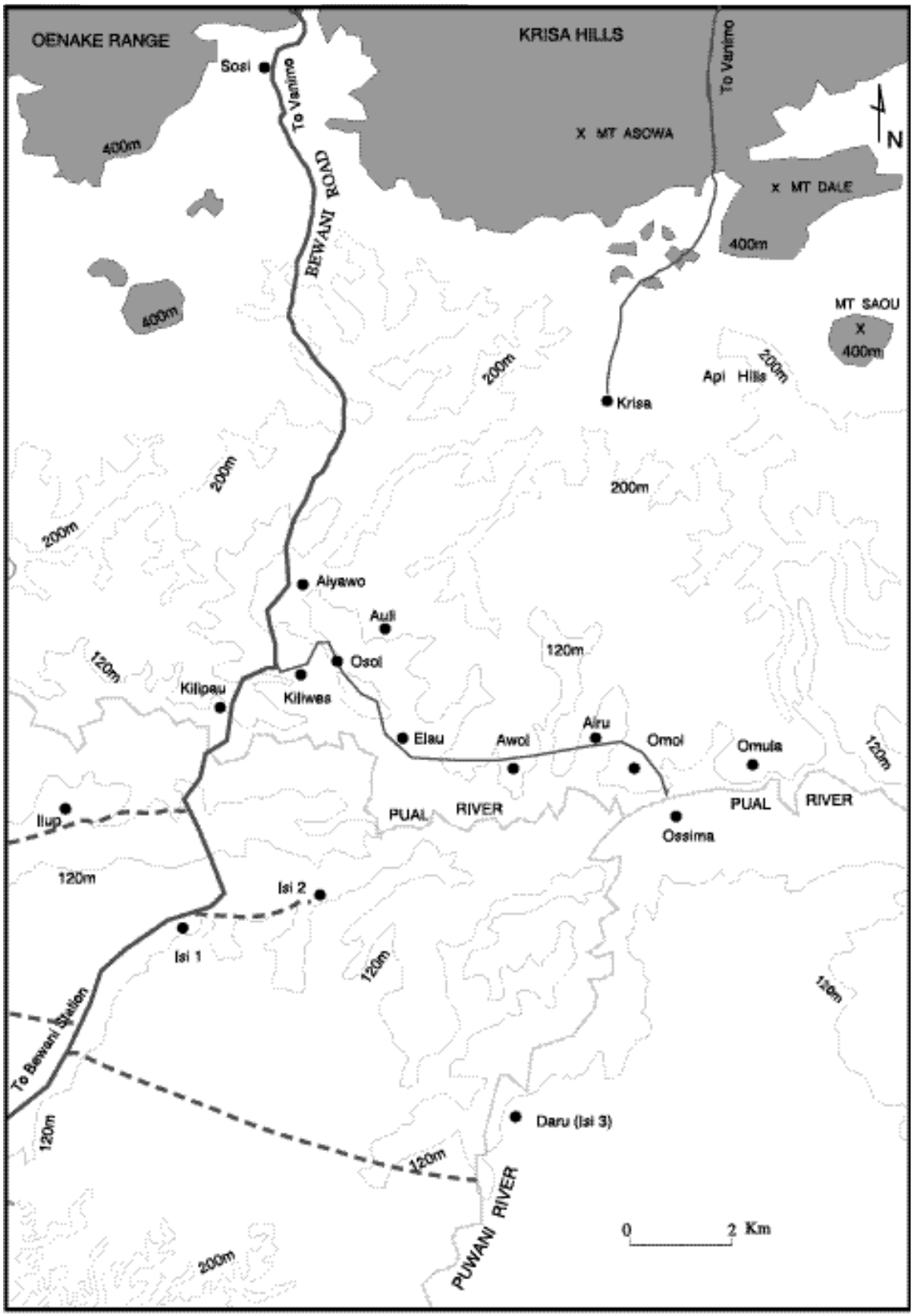
In the long-term only better access to information by the landowners, that is by rural villagers, will prevent degradation of the environment through large scale resource extraction such as logging or mining. Most landowners who now make decisions about logging or mining on their land are illiterate and innumerate. Education, that is the provision and funding of schools, gives the next generation of landowners access to the necessary information to sustainably manage and preserve their environment.

However, such long-term measures are only effective if they are combined with short term measures. Once the forest has disappeared, even a well-educated generation of landowners cannot bring it back.

The implementation of projects:

Villagers in rural areas should be informed about planned projects well before these are implemented. This information has to be delivered personally in every village and the project explained and discussed with the people who are meant to benefit from it.

Not only remote areas suffer from lack of communication, infrastructure, and marketing facilities; assumptions arising from people's proximity to an urban centre or an early contact situation can lead to a wrong assessment of their abilities to cope with modern problems.



The Kilimeri area (based on Kuaso, Mandui & Mondol (1998)

– – – – – – skidding roads

1. PLACE AND PEOPLE

Vanimo, situated on Papua New Guinea's North coast, is - like all Melanesian towns - relatively recent; it was established as a patrol post and then abandoned and reoccupied several times during the period of Australian administration. Only after 1967 did Vanimo become the headquarters of what was then the West Sepik District and today is the Sandaun Province. Besides a hospital and airstrip, Vanimo has the usual facilities: administration offices, correctional institution, market, stores, banks, post office, church, high school, and it is also the seat of the bishop of the RC Diocese of Vanimo, which runs its own stores, workshops, a health centre and high school. Vanimo constitutes a centre in terms of marketing, wage employment opportunities and services for the coastal and inland villages within a radius of about 40 km.

The Kilimeri Census Division lies south of Vanimo. It comprises 15 census units, that is villages, with a total of 2.411 inhabitants (1990 census; estimated figures for 1999: 3.500). Of these settlement units, 14 share a common language, which belongs to the Bewani Language Family (Border Stock, Trans- New Guinea Phylum), one language which is only spoken at Krisa, belongs to the Sko Phylum-Level Stock (S.A. Wurm & S. Hattori, Language Atlas, Pacific Area 1981). Despite these linguistic differences, the people of the Kilimeri Census Division share a common culture with only minor local variations. This common culture shares elements with the adjacent areas of the Indonesian part of New Guinea, especially distinct techniques of sago processing and consumption.

Most of the area is accessed by the Vanimo-Bewani Road (see Bouly), which traverses it from north to south as well as by a strip for light aircraft near Osima (Catholic) Mission at the eastern edge of the area, and there is also a government airstrip at Bewani south of the Kilimeri.

Some of the villages and hamlets are situated on the breezy tops of the coastal range (Oenanke Range) at altitudes around 300 m ASL, others cluster on low limestone ridges in the Pu-Al basin (formerly Nemayer or Neumayer River) at lower altitudes (at about 100 m). Annual rainfall exceeds 2500 mm and 95% of the area is covered by Lowland and Lowland Hill Forest (forest typology after Paijmans 1975).

Characteristically sago stands *(Metroxylon sagu)* are found in the swampy river- and creek basins, while fruit-tree groves are situated further up on the hillsides and on the hilltops within or close to the settlements. The dominant staple is sago starch, complemented by semi-domesticated and wild fruit and vegetables, and the produce of low intensity gardening. The hunting of feral pigs, birds and marsupials as well as fishing and collecting are important sources of animal protein (Klappa n.d., Siuta 1998 a and b).

The traditional political authority is in the hands of the leaders of the patriclans, which are also the landholding units. The modern administration has installed village

councillors, who are often identical with the traditional leaders. (Kocher, Klappa 1999). Normally a village comprises several patriclans, which are restricted to this village, but there are exceptions. The major binding links between patriclans, being exogamous, are marriage transactions.

The Kilimeri area lies within the Vanimo Timber Rights Purchase area, which was defined as early as 1967. The land of several villages has been logged, another part is now being logged, and others are due for logging over the next few years, with 80 to 90% of the respective villages' territories subject to selective felling. The proceeds from the sale of timber are considered a major source of income by the villagers, although those who have already been paid have spent the money within less than a year (mainly on clothes, food and beer). Only a few men have succeeded in reinvesting their share into small scale business (e.g. tradestores). Dissatisfaction with the logging company is high, as the monies received are considered much too low (Kameata, Topni 1998). Minor sources of cash income are cash-cropping of cocoa, and some salaried employment with the government, and temporarily with the logging company. Some men grow bananas, pineapple and root crops or rear pig and chicken for sale to the provincial Division of Primary Industries. The women travel either to Vanimo or Bewani to sell surplus foods at the markets (Topni 1998 b).

The data presented focus on settlement units of the Kilimeri area: Krisa, where timber extraction ceased in 1994, and Isi which underwent logging during the research period from 1997-99. Comparative data are drawn from other Kilimeri villages where FRP researchers were active.

Isi

> *Isi 1 had in 1997 a total population of 133, of which 65 % were male and 35% female, Of the total population of 157 living at Isi 2,52 % were male and 48% female (Kameata, Siuta & Topni 1997).*

The Isi villages in the Pu-Al basin, at altitudes around 100 m, consist of several hamlets, which are either strung along the main Vanimo-Bewani road (Isi 1) or situated further away from it but accessed by skidding roads constructed by the logging company (Isi 2). Fragmentation into different hamlets is an ongoing process caused by disputes over land, which induce one of the antagonistic parties to move out and found a new hamlet.

Isi has a population of 290 people in 42 households. 12 exogamous patrilineal clans are the landholding units, but members of various other clans of the Kilimeri area have marriage ties to Isi clans and have moved in following the logging operations, where they have secured casual employment with Vanimo Forest Products on the basis of land claims. This is also reflected in an unbalanced male/female ratio for the hamlets of Isi 1 which are situated along the main road, see inset (Kameata, Siuta, Topni 1997).

KRISA

Krisa people claim an expanse of land about 20 km in radius, with the main village located roughly in the centre at an altitude of 300m. The community is made up of six major patrilineal clans, which constitute landholding and exogamous units. Yet, this system is rather fluid: the counting, naming or association of clans varies with individuals giving the account; actual clan affiliation depends to a high degree on personal choice, with adoptions of stepchildren and outsiders being frequent; and claims to land and resources are also established matrilineally.

The main village comprises about 600 people in 70 households, similar numbers live in small camps that are scattered along the recent logging road to the coast. It seems that traditionally the main settlement has been more compact and only during the last decades spread out and broken up into smaller camps, particularly fostered by the advent of the road. Conversely, the mobility of individual families appears to have decreased; a more 'Western', sedentary lifestyle and the children's school attendance limit the frequency and extent of stays in temporary bush camps.

While Krisa markedly differs in linguistic terms from the neigbouring villages in the Pu-Al basin, its people have entertained close relations through trade partnerships and marriage ties. Krisa used to be a pottery centre and exported its products all over the Kilimeri area. Distinct shards found by the archaeology team document these links (Kuaso, Mandui & Mondol 1998). However, with the advent of metal pots local pottery manufacture has been abandoned.

2. TRADITIONAL LAND MAN AGEMENT AND LAND USE

The people of Krisa employ a range of subsistence practices: hunting, gathering, swidden gardening and arboriculture. The latter is the most characteristic feature of the subsistence system and yields food as well as medicines and manufacturing materials. Prominent representatives from a long list of nurtured or cultivated trees include: the sago palm *(Metroxylon sagu)*, the coconut *(Cocos nucifera)*, the betel palm *(Areca catechu)*, and the 'tulip' tree *(Gnetum gnemon)*. Three of these trees figure prominently in the prototypical traditional meal: sago jelly accompanied by leaves and young shoots of the 'tulip' tree cooked in coconut milk, enriched by game or gathered sources of animal protein.

In contrast to the nurture and cultivation of trees, gardening proceeds on a small scale. It yields supplementary food rather than staples, and individuals or families may well go years without the preparation of any swidden plots. The main role of gardens emerges when viewed in conjunction with tree cultivation. On preparation of a swidden plot, useful trees are left standing and protected from fire; of other trees the seeds are sown or their seedlings transplanted from elsewhere; those that germinate adventitiously will be tended and fostered if necessary; others again need no attention at all but as regrowth plants increase in abundance. The main function of gardening thus appears to be the propagation of useful trees, rather than the immediate and direct provision of crops.

> *The forest in the Kilimeri area has been subject to human interference for a long time, and accordingly its species composition has been changed by people, who encourage useful species and suppress unwanted ones.*

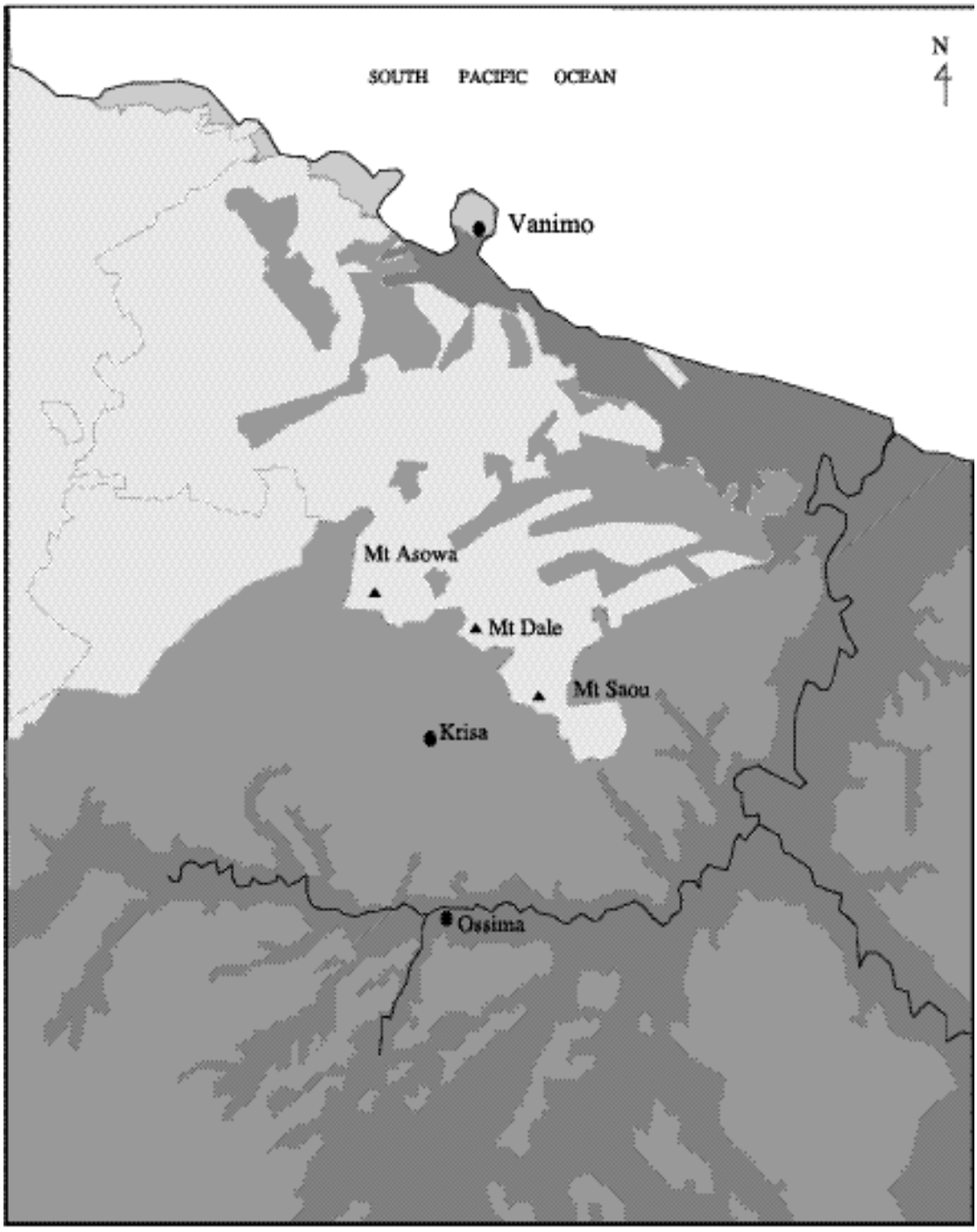
A cursory count in a garden at Isi 1 revealed that there were 11 different trees, two different palms and two kinds of bamboo planted. Another seven tree species and two palms had grown spontaneously but were left standing and their growth encouraged by regularely weeding around them. Consequently, a host of useful trees are found in old gardens and fallows. They provide the bulk of crops especially in their later stages. In their earlier stages, fallows are particularly actively attended to. Thus, species composition is not only determined by the initial disturbance of preparing the swidden plot, but equally by the human manipulation of regrowth. In such a subsistence system gardens assume an auxiliary role. Thus, in the Kilimeri area, the border between forest and garden, between cultivated and wild, is not solid but permeable. The same plant species which grow wild in the forest, may also be tolerated, if not cultivated, in the gardens.

Gardens are quite large: the average garden at Isi 1 covers 2120 m^2, the largest 7000 m^2 (Topni 1998 a). Although new gardens are not established on a regular basis, years sometimes passing before a household decides to clear a new plot of land, this land management system with its stress on the propagation of useful trees, has - applied over centuries - slowly but steadily changed the floristic composition of the forest. People have encouraged species which are useful to them and suppressed unwanted ones. Similar management techniques are applied to sago groves which are situated in swampy areas along the creeks and rivers. Sago palms are constantly, but in small numbers, replanted from suckers. As they need light to get established and grow, people fell one or two trees to create a gap in the canopy. However, they will not elect to fell useful trees, but rather trees which are of no value to them.

Wild mushrooms as well as grubs found on dead wood are important contributions to the daily diet of the people at Isi.

Wild and semi-cultivated trees are put to a wide range of uses (table 1). Not unexpectedly the majority (96%) of the 149 recorded locally distinguished trees are used for fuel for cooking and heating. 47,7% of them host edible grubs and 38,9% edible mushrooms, parts (fruit, leaves) of another 15,4% are directly used for human consumption. Another 8,7% attract - when in flower or fruit - a range of game animals and/or birds and are consequently used by hunters as hides to ambush game. Men hunt nine kinds of bandicoots, 15 types of cuscus, ringtails and rodents, three kinds of wallaby, as well as cassowaries, crocodiles and large lizards. At least 60 species of birds are hunted and a variety of fish, turtles, prawns and crabs are caught in the rivers and creeks. In addition the women collect for food 18 kinds of frogs, four types of spiders, three kinds of crickets and three kinds of small lizards.

The use of the timber of 43,7% of the trees for light construction (i.e. walls, floors and roofs of houses) is crucial to the local lifestyle. Only 6% of the trees are used for heavy construction purposes (house posts). However, these hardwoods are also selected by the logging company. Another 7,4% of trees are used for the construction of temporary shelters and houses in the forest, and 27,5% yield materials for implements and items. Additional uses of tree products include, (food) wrappers and mats (9,4%) medicines (8,7%), and their use for spice, repellents, fertilizer, intoxicants (4,7%).



Key

- Foraminiferal mudstone of late Pliocene with coquinal lenses and shell sandstone. Possible carbonaceous material in the upper part
- Hard massive white limestone of late Miocene to early Pliocene
  Late Pliocene to Pleistocene coral reef limestone with minor calcareous sandstone and siltstone at base
- Holocene alluvium consisting of gravel, sand, silt and mud
- Possible mixture of hard massive white limestone and mostly Holocene unconsolidated coral reef limestone

3. THE TOWN : VANIMO

Vanimo population figures
1971: 1.064 (Allen 1976)
1990: 7.861 (National Population Census)
1999: 20.000 (Estimation)

Vanimo is characterised by its rapid population growth, by its economic dependance on the logging industry, and by its situation close to the Indonesian border: it is a 'boom'town, a logging town, and a border town. The availability of timber off-cuts from the saw-mill at Vanimo has facilitated the construction of squatter settlements and has thus increased rural - urban drift. Vanimo is one of the fastest growing townships in Papua New Guinea.

About 75% of the land within Vanimo township is occupied by squatters.
The vast majority of the people of Sosi village now live in Vanimo.

The migration of considerable parts of the rural population to the urban centres is a major problem in Papua New Guinea. Rural areas with little cash earning potential lose the majority of their able-bodied men and a large proportion of their women of the same age group to city life.

For the people from the villages of the Kilimeri area, Vanimo is not only a market place for their produce but also their major link with the outside, 'modern' world. It is a place of affluence and luxury with running water, electric power and well-stocked stores. If there is transport available they take the opportunity for a day-out in town, even if they have no 'business'there. At Vanimo are also the headquarters of Vanimo Forest Products, which is a subsidiary of WTK Realty.

WTK Realty, and thus Vanimo Forest Products, is owned and controlled by the Wong branch of the single Chinese clan who dominates the logging industry in Sarawak (Filer 1997).

Every pay day, the men who have wage employment move in large cheery crowds to Vanimo to return only late at night or the next day in an often intoxicated state (and with not much of the money left). It is during their visits to Vanimo - either when they collect their wages, sell produce or just to stroll around - when the people of the Kilimeri area obtain information about events in the narrower or wider surroundings, and consequently carry the news back to their villages. The trade in reports and gossip is abundant and rumours are rife.

Many people of the Kilimeri area travel to the town of Vanimo to sell surplus of produce procured by gardening or extraction of wild and semi-domesticated resources. Vanimo has several markets, a main market in the town centre and four smaller markets along the roadside further out. The majority of sellers exclusively market garden produce, although this is subject to seasonal fluctuations (table 2). The most popular items sold at the Vanimo markets are betelnut *(Areca catechu)* and betel pepper *(Piper betle)* followed by banana, coconut and greens. Of the forest produce sold, the bulk is made up of sago and greens (sold by 9 and 12% respectively of the sellers on all five markets in July/August 1997). Other forest produce sold at Vanimo include mushrooms, 'taun' fruit *(Pometia pinnata)*, eggs of megapodes and cassowaries, game, and nettles *(Laportea decumana)* for medicinal purposes. Wild and semi-domesticated greens sold at Vanimo include,'tulip' tree leaves *(Gnetum gnemon)*, fig tree leaves *(Ficus copiosa)*, leaves and shoots of various ferns as well as water cress. Game sold at Vanimo includes pork, wallaby and bandicoot.

The urban household consumption study shows corresponding figures: at their last visit to the markets, 77% of the respondents bought garden produce only while 15% also purchased forest produce. In addition, 34.5% of the urban respondents visited the forest in order to hunt and collect food as well as to maintain gardens. Most of those who did not visit the forest, originate from other parts of the province or from other provinces and are thus not allowed to make use of the forest near Vanimo. More important to urban residents is the forest as a source of timber for construction and fuel. More than 75% of the respondents buy or collect timber off-cuts at the local saw-mill (Topni 1989 b).

Like their rural kinpeople, most urban residents regard forest resources as inexhaustible or only to be depleted in more than 20 years (table 3).

Access to town, and thus to information and infrastructure, is limited by the transport possibilities available. PMVs (Public Motor Vehicles) operate within Vanimo township and along the rural roads. However, the majority run only on the roads along the coast and only a few operate on an irregular basis between the Kilimeri area and Vanimo town. A fee of several Kina is charged per person and market goods are subject to an additional freight charge, thus considerably reducing the return on market sales.

> *Access to Vanimo town and its services is handicapped by insufficient transport possibilities: most buses do not operate on the inland routes.*

Therefore, people often travel to town in village based cars, which were bought with timber royalties and can be used either free of charge or for considerably less than the 'official' buses. Many of these vehicles have to be left on the outskirts of the township, as they are either not licensed or driven by an unlicensed driver.

With the opening of the land border early this year, Vanimo is now linked to Jayapura, the capital of the Indonesian province of Irian Jaya, by an overland route. There are still no road links between Vanimo and the rest of Papua New Guinea.

4. CHANGE AND PERCEPTIONS OF THE FUTURE

4.1 Experienced Change and Expectations of the Future at Krisa

In Krisa, as in many other parts of Papua New Guinea, major changes have taken place during the last two or three generations. Malay birdhunters arrived at the beginning of this century, introducing metal tools and guns; the Second World War brought the Japanese invasion, as well as forced labour and war service for some of the men. The Australian administration established posts in the area from the 1920s onwards, taken over by the national administration after Independence in 1975; the Catholic mission has been active in the area since the 1930s, with the first Krisa people probably converting after the war. The activities of 'Westerners' were accompanied by the introduction of 'Western' values: the 'laziness' of local people was condemned, sedentariness advocated and Western'- type agriculture encouraged, see inset for two seriously biased statements.

> *"Inland the diet is extreme poor. Village books relate many attempts to encourage the people to go in for more extensive gardens but as yet the people do not take to the idea willingly. There is no doubt but that the produce obtained from extensive gardens is well received but the work entailed bringing about such produce tends to frighten the average native. With the abundance of sago palm it is obvious to all that simplest way of obtaining food is to chop down an occasional sago palm and allow the women to do the hard work, that is if they can manage to find the time to cut down the said tree." (Patrol report 9/1946-47 Vanimo, D. Young-Whitforde)*
> *"If you go inland they are still nomads, they do not make gardens, that is why there is so much malnutrition" (Catholic Sister 1998).*

This advocacy of 'Western' values was complemented by the increasing availability of 'Western'goods and services since the Second World War: 'Western'clothing, articles and foodstuffs were introduced, roads and airstrips built, and health centres and schools established. This trend towards modernisation, and the concomitant advent and advance of the cash economy, culminated in the brief but intensive economic effects of the large-scale logging operations of the 1980s and 1990s.

According to the stipulations of the Logging Project Agreement (between the company and the representatives of the local landholders), the company constructed 'permanent' (in contrast to bush material) buildings for the aid post and its orderly, as well as classrooms and teachers' accommodation in Krisa. The village became the centre

of an extensive road network (see Bouly); royalty money was flowing and spent freely on cars, beer and commercially available goods and foods. Since then, the flow of cash has been reduced to a trickle again, and transport to and from town, and with it the marketing and acquisition of goods, has been progressively hampered by the decay of the logging road. Complaints are rife about environmental destruction caused by the company, paucity of services and royalties received, and neglect by the government. 'Development', which had appeared so close, has yet again proven elusive.

> *"The company has left us - how shall we make a living [now]? The government does not give us any assistance" (Krisa village 1998).*

The changes experienced by Krisa people during recent history continue to influence their livelihoods and aspirations. There is almost full attendance at elementary school. This not only allows for a level of formal education but also appears to be the greatest single contributing factor to the disappearance of the vernacular language, as only English and neo-melanesian Pidgin are used in conversation and teaching. People fully subscribe to the Christian faith, and the 'pagan' Men's House Cult, as well as the formerly important hunting ritual, have been abolished with conversion. As promoted by the 'Westerners', sedentariness and agricultural activity have increased. Cash-cropping projects, however, though tried in a multitude of variations over time, have been repeatedly abandoned, while mobility and activities in the forest are regarded with disapproval by at least part of the community, who advocate a more 'Western' type of subsistence. Generally, traditional subsistence activities are considered strenuous and laborious, and the experienced behaviour of companies and government deceitful and negligent, compared to the 'Western way of life', which is perceived as a carefree existence, with unrestricted access to money, goods and services. Attainment of this 'western way of life', viz. 'Development', is commonly considered conditional on the availability of money, the provision of infrastructure, and the application of machinery — all under the caring attention of some larger bodies, that is companies or the government. These images of 'Development' grade into a millenarian ideology with part of the community, when a prescribed belief and lifestyle are added to the presumed preconditions for attainment of this desired state. The desired condition itself is perceived to include freedom from evil forces; and the transforming event is expected for the turn of the Millennium. With or without that spiritual component, the exploitation of natural resources figures prominently on the imagined path towards 'Development', as apparently the only major source of cash income and modern infrastructure (Klappa n.d.).

4.2 Expecting the Day of Wrath at Daru

To the remote village of Daru (Isi 3), which is isolated from the main road by the torrential waters of the Pu-Wani river and from Osima mission station by several hours walk across swamplands, news about events in the wider area and the outside world arrive only by word of mouth and are interpreted on the basis of the only 'Western' knowledge accessible to people: the teachings of the Bible brought to them by missionaries.

Incomes are very low and people jealously look at their more fortunate neighbours who receive royalties from the logging company. There is no aidpost in the vicinity and no school. People's self-esteem is low and they feel alienated. Stories told at their fire places summarise these feelings: once there was a better life but they themselves have done wrong and are thus forced to accept a shabby livelihood.

"In fomer times, we had another lifestyle, then something happened. We had [different] food, then it changed, we had rice, meat and flour. We ourselves made a mistake. We had a party and a husband forbade his wife to participate. Then he left the house to go somewhere else. When he came back, he knocked at the door but there was no answer. He got angry, took his gun and went to the party. There he saw his wife dancing with another man. He shot her and her boyfriend. This caused a big uproar which lasted until dawn. We got punished for this. Before we used this good food, that was finished now. All the other countries, America, Indonesia, they assembled and decided: who are you, you from Sandaun [province], God has given you good things, these you lose now. They gave us rubbish, we have rubbish food, which is [also] hard to provide. We were given sago, spiders, pigs, cassowary and fish, all these foods. Our ancestors had broken a law, therefore we are fouled up and our lifestyle is wrong" (Daru village, February 1999).

People of Daru have recently combined accounts of events in their wider neighbourhood with a millennial discourse prevalent all over Papua New Guinea. This is based on the Bible (mainly the book of Revelation) and is also present in the Kilimeri area (Kocher Schmid 1999). These events were: the tidal wave which destroyed several villages in the Sissano area in July 1998, a recent collision of powerlines at Vanimo which created in people's view "fire out of nothing", and a cyclone warning. The sequence of destruction by floods and then by fire has led the people of Daru to believe that the end of the world is imminent. The floods and fire will be followed by violent storms, and the warning which was broadcast by the national radio station, that a cyclone was heading towards Papua New Guinea and Australia and might touch the southeastern area of the country (which is a long way from the Kilimeri area), confirmed people's worst fears. In February 1999 they have felled within their settlement all coconut palms and breadfruit trees, valuable and cherished sources of food, out of fear that the expected storms at the

end of time will have these trees crashing on their houses and kill or mutilate them all.

This is the sort of story which induces members of the elites to disparagingly comment on the backwardness of rural people. However, the fears these people experience are real, and the lack of future projects illustrated by such discourses is alarming.

5. PERCEPTION AND IMP ACT OF LOGGING

> *"We have lived a long time in our traditional ways and we do not want to do that any more. We want to live differently " (Sosi village 1997).*
> *"We want a change in this modern world" (Aiyawou village 1997).*

Kilimeri people do not object to selective logging where only the tall trees are removed by loggers. To the contrary, the - at least to an outsider - ambiguous designation 'the developer' for Vanimo Forest Products in the project agreements, is taken at face value, as this company builds roads and bridges for its extraction purposes, establishes schools and aidposts as part of the project agreement, provides incomes, and will - following people's demands - clear fell areas to later establish cocoa plantations. Tall trees are hardly used in the traditional subsistence economy: building materials are mainly taken from regrowth and pioneer species and from protected or semi-cultivated trees. Thus, Vanimo Forest Products, the 'developer', removes trees which are of no apparent use to the local people and pays for them.

Income from timber sales are a one-off, if these sums are not reinvested but spent, no 'development'is initiated. In fact, most of these moneys are spent on consumables like store food, clothes and beer or on vehicles. Women tend to replace their family's diet of sago, collected greens and proteins, and garden produce by store bought prestige foods like rice and tinned fish. They also replace the often torn and worn-out clothes by new ones. Male spending makes a bigger impact: their money is spent on beer and gambling and often a car is bought. These cars are rarely maintained and driven ruthlessly up and down the rough Bewani highway and along the skidding roads. They do not last long, either being crashed by their inexperienced drivers or their engines blocked due to neglect (e.g. they run out of lubricant).

The wish to participate in the 'Western' lifestyle is high and logging money seems to the Kilimeri people to constitute the key to at least temporarily achieve this goal. People from Osol and Ilup villages made this quite clear during group discussions held in 1996 and 1997. Life 'in the bush' was considered to be inferior to the Western way of life: the main staple of sago, vegetables and game being a poor diet, the houses built from bush materials being inadequate (Kocher Schmid 2000). People wanted to have 'permanent' houses like the ones built by the logging company for school teachers and aid post orderlies, electricity, water supply, roads and cars, and a recurrent topic, they wanted to replace their traditional diet by rice and tinned fish and meat.

People from villages whose territories were not yet subject to logging in early 1999, that is territories within Block 2, were closely monitoring the progress of the operations in Block 1, which were coming to a close and were eagerly expecting operations to begin in Block 2. These expectations were high, as these people had to watch their neighbours joyfully spending the logging money, eating store foods, drinking beer, and proudly displaying their cars. They had seen that the money did not last long (most of it was spent within a year), that no sustained effect was experienced, and that their neighbours were soon back to eating sago and bush foods while their wrecked cars littered the roadsides. In Krisa, for instance, only 2 of 87 people still had some of the timber money in 1996, and the sums received were in retrospect considered to be grossly inadequate, 86% of the respondents thought that the company had not paid enough for the timber rights (Kortendick 1996). Generally there was also a feeling that the 'kampani' had deserted them, had let them down.

However, despite being shown at close quarters the short term nature of such an influx of easily earned money, people still want to participate - experience the short-termed bliss of having seemingly inexhaustible amounts of money to spend on whatever they like. Many of them were quite critical about their neighbours, and commented on the negative and disruptive impact of excessive drinking and gambling. The same people, when asked on what they will spend their logging money once operations have proceeded to Block 2, listed the purchase of consumables as a first priority.

> *23 people out of a total of 290 persons currently living in 42 households at Isi have salaried work, that is 8% of the population have employment and only about half of the households have a wage income (Kameata, Siuta & Topni 1997). The bulk of people's requirements are met by subsistence, that is the production of sago starch, hunting and gathering, and gardening.*

The income generated by timber royalties is considerable (up to 20.000 Kina per household, i.e. about E 8.000, with a rate of approximately 10 Kina per cubic metre), incredible sums for people who might make at most a few hundred Kina per year by selling cash crops or garden surplus. Table 4 gives the fortnightly incomes generated by various activities. Further, during logging operations on their territory, the respective landowners are employed by Vanimo Forest Products. However, semi-skilled employment in the logging sector is only on a casual, temporary basis and will cease once the logging operations move on, as it is the policy of the company to employ the landowners of the respective territories. Salaried employment other than with the logging company is minimal, as table 5 for the Isi villages shows. 21 people are directly employed by Vanimo

Forest Products, one is a village spokesman in the landowners' association, and only one is employed by the Department of Health as an aid post orderly.

The territories of other villages of the Kilimeri area have already been logged out. Here the opportunity for semi-skilled wage employment has disappeared with the logging company. Money and their dependency on it, is an ever-recurring concern of the people in the area, especially in villages where logging operations have ceased and with it the flow of money. In Krisa village for instance, only seven of 132 adults had a wage income in 1996, and more than half of the people said that their annual cash income was between 0-200 Kina - about E 80 (Kortendick 1996). At Krisa during the peak of the logging operations in this area, there were four trade stores operating, but as the logging operation died down, three trade stores broke down, leaving only one now operating. Table 6 shows the figures obtained by Ian Leklek in 1996 from the one remaining tradestore at Krisa. As during the logging operations four tradestores were operating, the figures for the June 1988 sales multiplied by three or four, give an estimation of the actual consumption of tradestore goods by the local population during this period. The consumption of rice had thus multiplied by about a factor of 45 to 60, tinned fish by about a factor 15 to 20 and sugar by about a factor 24 to 32. With the logging operations terminated and wage labour possibilities gone, the purchases at the tradestore have declined accordingly.

There are indications from Krisa that selective logging has serious long-term impacts on the environment: several years after felling the large forest trees, their root systems which held together the soil, have now rotted. For the last two wet seasons Krisa people have experienced increasing landslides, which destroyed gardens and seriously damaged the road.

Selective logging is considered by the people of the Kilimeri area to be mainly beneficial. With the money obtained they can fulfil their dream - at least for a short time - to participate in the 'Western' way of life, and in the short term there are only a few ill effects felt. Indeed, selective logging has enhanced the abundance of some important traditional food resources: mushrooms and grubs collected from dead wood are an important part of the traditional diet at Isi as in other Kilimeri villages. After the logging operations, which left the forest littered with logs, tree stumps and other timber debris, the women of Isi follow the 'road of mushrooms' (an overgrown skidding road) through the forest to gather an abundance of these delicacies. Also those 'limbum'palms (arecoid palms) which need the light of a broken canopy to regenerate regrow abundantly, their young plants yielding the much cherished palm cabbage.

However, there are complaints about Vanimo Forest Products having destroyed the 'environment'. The term environment as it is used in the Kilimeri ('invairemen' in neo-melanesian Pidgin) is at closer inspection narrowly defined: it only includes those elements of the environment which were damaged by the heavy machinery during the logging operations and for which people want to receive compensation in the form of an environmental levy demanded from the logging company. These elements are:

- semi-domesticated 'tulip' *(Gnetum gnemon)* trees, which are an important source of vegetable food
- fostered 'limbum' palms (arecoid palms) and rattan canes, which yield crucial construction materials
- a Cinnamon tree species, which has various medicinal uses
- several tree species which when in flower or fruit attract a range of game animals or birds, and where hunters lie in wait
- breeding areas of brush-turkeys (brush-turkeys incubate their eggs in mounds, people seasonally harvest the eggs, the breeding grounds are jealously guarded clan or lineage property).

> *The destruction of breeding mounds of brush-turkeys not only affects people, who have less brush-turkey eggs to eat but is also a severe disturbance of the ecological system of the forest:*
>
> - *Heavy logging machinery destroys breeding grounds of brush turkeys*
> - Brush *turkeys are the only seed dispersers of* Pararistolochia *vines*
> - Pararistolochia *vines are the exclusive food plant for the larvae of birdwing butterflies* (Ornithoptera spp)
> - *Birdwing butterflies are endemic to New Guinea and include the world's largest butterflies. They are also used as «flagship» species in conservation and are CITES listed (D.P.A. Sands, personal communication 1998).*

It is tempting to consider the people of the Kilimeri area greedy and spoilt by the influx of logging money and - in a rural Papua New Guinea context - high wages for semi-skilled labour paid by Vanimo Forest Products. To characterise them as one administration official did (« We have no problems but just people. People just want money », Kameata, Topni 1998) is false. The geographical proximity of the Kilimeri area

to the early contacted North coast (1827 by Dumont D'Urville) may suggest that Kilimeri people are well acquainted with 'Western' ways and thinking, including the handling of money. However, the area has long been a quiet backwater, and with the exception of Krisa and Osima, where the Catholic mission set up schools in the 1950s, local people have only had access to schooling since about 1995. Accordingly, the vast majority is illiterate and innumerate and very effectively excluded from access to information and ideas. They have to build their understanding of the 'Western' world with its technology and monetarisation on scraps of information handed over to them by word of mouth, and therefore on information prone to be altered, abridged, or reinterpreted while travelling along long chains of informants. How can they be expected to make well-informed decisions on spending and investing large sums of money? And how can they negotiate on equal terms with representatives of the logging company and of the administration?

> *Many people in the Kilimeri area believe that Asians - that is the representatives of the logging company - as well as Europeans are non-human and immortal.*

Selective logging has few short term disadvantages for local people, the advantages by far outweigh them. It provides money and therefore access to 'Western' lifestyles: it also creates forest successions with abundant food resources. A selectively logged forest still looks like a forest, in contrast to a clear felled area.

The long-term ill effects of selective logging are not obvious to people: their traditional biological knowledge, though detailed, does not include experience of forest disturbance on a large scale. Western ecological knowledge, which may predict long-term effects of large scale forest disturbance, is not accessible to them.

Logging has serious negative impacts on the supply of drinking and washing water for local people. Skidding roads are often built across watercourses and not equipped with proper culverts. After rainfall, the creeks on which people are dependent for their water supply are muddy. Worse, the chemicals used to preserve the felled logs from rot further pollute the same water resources. The EU has run a project on rural water supply in Sandaun Province with a manager based at Vanimo, which aimed to provide rural areas with rainwater tanks, thus securing safe drinking water. However, the impact and success of the project was minimal. This failure can be ascribed to the lack of information of rural people about the program. Only in early 1999, when the program had already closed down, had people in the Kilimeri area heard by word of mouth about the possibilities of improving their water supply.

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APPENDIX : TABLES

Table 1 Isi: uses of wild and semi-cultivated trees

used for	*number of recorded locally defined tree speciesn=149*	*in percent*
firewood	143	96,0%
collecting edible grubs	71	47,7%
light construction	65	43,6%
collecting edible mushrooms	58	38,9%
implements and tools	41	27,5%
food	23	15,4%
medicine	13	8,7%
waiting at feeding animals and birds	12	8,1%
temporary construction	11	7,4%
heavy construction	9	6,0%
wrappers, mats (leaves)	14	9,4%
various purposes(repellents, spice, fertilizer, intoxicants, 'magic')	7	4,7%

Table 2 Vanimo: percentage of market vendors selling forest produce

Month	*Percentage of vendors selling only garden produce*	*Percentage of vendors selling forest produce*	*Total number of vendors*
February 98	64,0 %	36,0 %	167
March 98	91,5 %	8,5 %	209
June 98	85,5 %	14,5 %	152
July 98	94,0 %	6,0 %	145
October 98	66,0 - 88,0 %	22,0 - 34,0 %	159 - 214
November 98	73,0 - 81,0 %	19,0 - 27,0 %	214 - 233
December 98	90,0 %	10,0 %	174
Averages for July/August 97	82,0 %	18,0 %	90

Source: Topni 1998 b

Table 3 Vanimo: Rate of forest depletion in local view

Forest will be depleted in	*Number of respondents*	*In percent*
5 years	9	10%
10 years	16	18%
more than 20 years	27	30%
never	32	36%
N/A	5	6%
Total	89	100%

Table 4 Kilimeri area:Income earned per fortnight

Type of activity	*Minimum in Kina*	*Minimum in Euro*	*Maximum in Kina*	*Maximum in Euro*
wage labour (logging company)	60	24	300	120
cash-cropping (cocoa)	40	16	100	40
market sales	5	2	30	12

Table 5 Isi: Employment by sector, employer and number of people involved

Sector	*Employer*	*Nb of people involved*
Logging	Vanimo Forest Products	21
Advocacy	Landowners Association	1
Health	Department of Health	1
Total		23

Source: Kameata, Siuta and Topni 1997

Table 6 Krisa:sales for June 1980, 1988 and 1996 at the tradestore

Items sold	*June 1980 before logging operations*	*June 1988 during logging operations*	*June 1996 after logging operations*
Spear roll (tobacco)	40 boxes	600 boxes	100 boxes
Rice	1 bale	15 bales	3 bales
Tinned Fish	2 cartons	10 cartons	3 cartons
Sugar	1 bale	8 bales	2 bales
Batteries	1 box	6 boxes	2 boxes

Source: Leklek 1996

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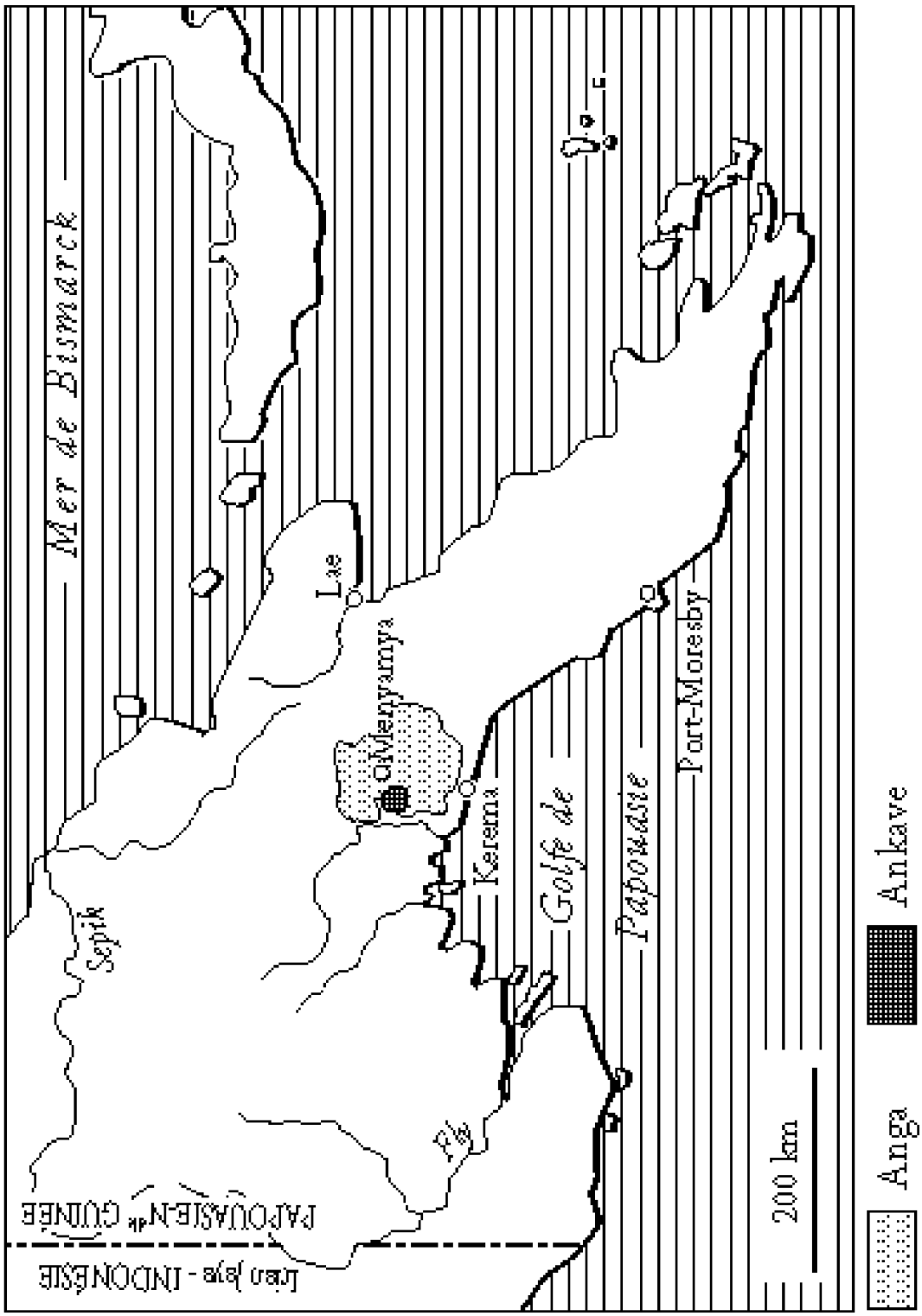


Map 1 : Location of the Anga in Papua New Guinea. The Ankave Three Valley Territory (after Bonnemère 1996: 41)

Even though tribal wars stopped 3 years ago, the Ankave still initiate their young warriors given their awarenes that their immense forest territory is coveted by the tribes of the over-populated upper valleys. Here, one of the initiated in the forefront (Ankave, Gulf Province, PNG, 1994). (cliché P. Lemonnier)

SUMMARY AND CONCLUSION

The Ankave today live in a situation which is characterised by poor sanitation, administrative neglect and by an exploitation in which they are the victims of their closest neighbours. Deeply attached to a way of forest use which leads them regularly to the lowlands where they are continually re-infected by mosquitoes who are vectors for malaria, Ankave focus all their hopes on the construction of an air strip and the installation of an aid post in their valley. Such an opening up to the outside will allow evacuation of the ill by air. Granting permission for one or more school teachers to come will lead to the construction of a school in the near future (two or three years?). In the short term the access by air will allow the Ankave to sell their coffee, which up until now, has been transported on the backs of men to Menyamya. Further cash cropping is planned: there is a proposed project to send fresh vegetables to coastal cities. This takes advantage of the geographical situation of Ankave territory halfway between the Highlands and the sea. The question will be how a fundamentally individualistic society can co-ordinate efforts to maintain a weekly vegetable delivery by airplane. In short, Ankave daily life will see as much change in the next 10 years as it has in the last 45.

There is not yet any threat to Ankave forest or more generally to their territory. It is critical to observe the way in which a non-threatened forest population makes the progressive shift into the state of development that other PNG societies have known for decades. Thanks to our knowledge of this area, which precedes these changes, we will be able to follow, in detail, the modifications people make to the perception and the management of their environment.

RECOMMEND ATIONS

Of all the PNG groups that APFT has worked with, this case provides the best example of a society living very much in an integrated way with the forest. From this we make the following recommendations:

Be fully aware of the exceptional nature of the situation and our responsibilities. As simplistic as it sounds, the image of a library lost every time an old person dies is very near the truth. Not only do entire bodies of knowledge disappear at the rate at which forest populations die, but these people are the last who have practical, specific knowledge of their environment, which is highly unique. The responsibility of decision makers is rendered that much greater (including the decision to finance more field research while there is still time).

The destruction of forests and forest populations is dramatic but the disappearance of the last forest societies is a catastrophe with immeasurable consequences. Fate has made this an issue for this generation of experts and decision makers. All means necessary must be used to make these people understand the significance of their responsibility.

Health services must be prioritised. Anyone involved in development intervention in PNG must be aware that in the rural areas (75% of the whole country), the level of health services has dropped in the last 20 years. People like the Ankave have no access to health services in spite of the fact that it has been forty years since they have been in contact with new diseases, such as tuberculosis. Every economic agent, conservationist or other group proposing some type of intervention should be obliged to include financing for health services being demanded by locals. Today their very survival is in question.

Tropical forest peoples are both members of traditional societies and citizens of nations. As members of traditional societies they keep alive the knowledge and techniques of those societies. As citizens they are also members of the international community which they know should furnish them the means to improve their health services and knowledge of the world. This meeting of 'depositories' of ancient knowledge and the world civilisation of the third millennium is unique. How we handle this meeting is critical.

Take care of the effects of the threshold. There are quantitative and qualitative thresholds below which the extent and the composition of tropical forests will no longer be able to support the management practices and maintenance of affected groups. In particular, one must watch for changes that result in irreversible modifications of forest areas which represent the totality of the area of a group (an entire clan for example). This segment of the society may find itself in a position in which it may threaten the wider social group and its relations to the forest. In the end it will require far more than just the anthropologists to help make the decisions.

1. INTRODUCTION

The Ankave are one of twelve Anga linguistic and cultural groups. They are descended from a population that settled in the high valley of Menyamya (Morobe Province) several thousand years ago. The territory now occupied by the Ankave –'agroforesters' and pig breeders - extends 25 kilometres from east to west and 28 kilometres from north to south (approximately 700 km^2) and spans an altitude of 400m to 2300m ASL in the Gulf Province, roughly in the central eastern part of the independent state of Papua New Guinea (Map 1: see Appendix 1). Numbering just under 1000, they live in three isolated valleys which are completely covered by dense tropical forest. Their settlements occupy the steep slopes of small mountain ranges running westwards and towards the lowlands, which are extensions of the long mountain massif stretching from the Krakte Range in the north to the sea in the south (Map 2: see Appendix 1).

The Ankave's use of the forest has not changed significantly by contact with the outside world, which occurred quite late (mid 1960's), its impact remaining relatively limited even today. Due to this, the Ankave present a rather exceptional situation, even for Papua New Guinea. No extraction projects, neither logging nor mining have been proposed for the Ankave area or among their neighbours. This situation has allowed us to conduct both medium - and long- term research into their management and utilisation of the environment. The synthesised data presented here are the result of research conducted between May 1982 and June 1998 during eight field stays, totalling 25 months of residence. The valley of the Suowi river, also called the 'Ikundi Valley' after the most important village (see Maps 2 and 3: see Appendix 1), is approximately 40 kilometres long. It offers an altitudinal succession of ecological zones: from the lowland swamps of the Gulf of Papua (around 500 metres in altitude) to the moss forest which covers the sheer sides of the mountain wall which closes the Ankave territory off towards the east. Regular use of the totality of these three zones leads the Ankave to constantly shift residence from one site in their valley to another. These movements characterise the Ankave lifestyle.

The Ankave provide not only a genuine example of the relationship between New Guinea communities and the forest but also offer an impressive list of uses of wild plants for food -we recorded 91 plants (among them six rarely eaten tubers), which are gathered from the wild or are semi-domesticated. However, the bulk of food is provided by horticulture and to a lesser extent by pig husbandry and hunting. Thus, they offer the opportunity to analyse a dietary system in which quantitatively marginal plants from a wide diversity of species contribute a high quality, varied complement to the diet.

2. GENERAL PRESENT ATION

2.1 THE GEOGRAPHICAL AREA

The dense hydrological network which runs throughout Ankave territory channels large quantities of water when the clouds from the Gulf of Papua discharge their water over the area. The rain feeds the rivers which then overflow onto the sides and finally join the Vailala which runs to the southern coast (see Map 4: see Appendix 1). The year is generally divided into two seasons: a less humid season from May to October, and a wetter season, from November to April. According to the records we maintained over a seven month period, there was 1756 mm of precipitation from July 1987 to January 1988. This period covered the driest season. The annual total should be around 3000 mm of rain.

The temperature changes not only according to the season but obviously also with altitude. In January temperature varies between 15°C and 25-30°C with cool nights, while in July the variation ranges between 25°C and 28°C during the day. Above 2000 metres altitude, irrespective of the season, the cold is intense while it rains. Between December and February rain showers and storms are frequent at the summit of the mountain peaks, which Ankave people have to cross in order to get to the Menyamya valley.

2.2 SOCIAL ORGANISATION

Despite the fact that their environment is 99% forest, that there is a very low population density and that they live semi-permanently and dispersed in the forest, the Ankave are essentially Highland people. Driven away by warfare from century to century and from valley to valley they reached their present location. They left the densely populated valleys of anthropogenic savanna for the vast stretches of forest with scattered hamlets where the isolated Ankave families spend most of their time. Above 1000 metres in altitude, some tongue-shaped clearings on the more or less flat ground of narrow mountain ridges above fast flowing streams indicate the presence of permanent hamlets (see Fig. 1). Each family has a house on stilts which they visit when ever an event requires the gathering of part of the population. In the past this would have been during times of active warfare, today for mourning, food distribution, initiations, the arrival of an evangelist or the presence of anthropologists.

Like all Anga, the Ankave are a ‘Great man’ society. In other words the affairs that mobilise collective attention are (or were) war and male initiation (Godelier 1982, Lemonnier 1997). The three principle hierarchies which structured social life were

expressed in these two events: the relation between 'Great men', the general subordination of women to men, the authority of older men over initiates of the early stages.

Unlike other Angans (Fischer 1968, Herdt 1981, 1987, Mimica 1988), the Ankave practice ceremonial exchange of food which, outside times of war, mourning or initiation, constitutes the essence of inter-familial social relations (Bonnemère 1993). These exchanges must probably be seen in the context of Ankave preference for relative solitude, which causes them to move throughout the year within their clan territories. Territories are defined and reappropriated by the work which is visibly carried out in and on them. Politically the Ankave are one tribe, made up of the entirety of Ankave language speakers. Both war and male initiations concerned the whole linguistic group. Until the end of the 1970's ceremonies were held, alternately, in the two main valleys (Angae or Ikundi).

2.3 ASSIMILATION INT O THE 'MODERN WORLD': STATE, CHURCH, MARKET

2.3.1 The Anka ve and the state

The mountain crests (between 2200 and 2800 metres) which separated the Ankave territory from that of other Anga groups, today mark the divide which separates them from 'modernity'. Lost at the farthest extremity of the Gulf province, today one of the poorest regions of the country, the Ankave are ignored by the authorities in Kerema (80 km further south), the official administrative centre on which they are officially dependent. The nearest road ends at Menyamya and it requires another two to four days walk and a climb over the steep eastern mountain wall to reach it. Since Independence (1975), which brought an end to temporary migration to the plantations which had begun at the beginning of the 1960's, the rare Ankave who do travel do not leave their valley for more than a few days. Consequently they have very little contact with the state, missionaries or markets.

2.3.2 The church

There were no significant missionary operations in Ikundi until the beginning of the 1990's. Then a national Lutheran pastor began to teach the Ankave to read. More than a dozen men (and one or two women) learned to read at that time. This literacy and the end of warfare, more than the Christian message, which has hardly changed their lifestyle, has brought about the greatest revolution for these people in the past 40 years.

2.3.3 Market

There are virtually no cash crops present among the Ankave. In June 1998, a dozen families from the Suowi valley went for the first time to Menyamya to sell coffee (25 to 35 kg on average) after they had shelled the beans either with a stone or their teeth. The trade of bark cloth remains, by far, the largest source of monetary revenue in the valley (155 pieces of bark cloth were transported to Menyamya in June 1998). The price of bark cloth varies between 1,5 and 15 PNG Kina per piece (about E 0,6 to 6). The Ankave, notably, are one of the few Papua New Guinea groups who produce bark cloth for purposes other than their sale to tourists.

The valley's economy has remained largely untouched by monetarisation. The purchase of food is uncommon. Apart from clothing which was distributed by the Papuan evangelist between 1992 and 1993, 'modern' consumer goods are still rare in the valley: aluminium pots (less than one per family), towels, bush knives (for general use), steel hatchets (also less than one per family).

There is no mineral or timber extraction in the region. The little money available in the communities comes from the trips that about 30 men made to the plantations in the 1970's, and from regular sales of bark cloth to neighbouring tribes. This money is used almost exclusively for bride price. The Ankave, therefore, use the forest resources to cater for their major needs: food and construction materials. As far as we can judge, they continue to use and manage their forest resource as they have done since moving to the Suowi valley approximately 150-200 years ago.

2.4 HEALTH AND DEMOGRAPHIC STRUCTURE

Skin infections and pneumonia affect the majority of Ankave, however it is malaria that, directly or indirectly, is the primary cause of death (the mortality rate approached 70% in 1997-1998). The Ankave are in the worst possible situation with malaria being semi-endemic. They are sufficiently in contact with Plasmodia (notably the very serious P. falciparum) to risk being reinfected every time they descend to the lowlands but without having the time to develop any immunity.

In both their gardens and the forest, the Ankave have an ample food supply, both in quantity and quality. Nevertheless their diet is unbalanced: its bulk consists of tubers and bananas, in spite of the fact that there are leafy vegetables or fruits rich in protein and fats abundantly available. The infant mortality rate is very high (350%), which means that 1 in 3 infants dies before the age of one year! This mortality rate is unusually high, even in the Papua New Guinea context. In fact, the only request the Ankave have made to the state over the past 20 years is to establish an aid post. This was one of the reasons why the Ankave began construction of an air strip in 1982. This air strip should be completed

shortly with the help of the French government at the request of the Ankave. The only healthcare the Ankave have received comes from the Lutheran Health Services (LHS) at Kwalplalim. At best the LHS organises a 'patrol' targeted at small child once or twice a year (MCH, Mother and Child Health Services). A radio transmitter/receiver was installed by the national administration in 1994. There are less than 1000 Ankave: around 50 live in the Saa valley, 300 in the Suowi valley, less than 700 in the Ankave-Swanson valley. The figures in tables 6a to 6f show a slight population increase over the past 10 years, which may be due to the periodic presence of anthropologists who provide some health care or, more likely, is just co-incidental.

For a tribe like the Ankave (Gulf Province, PNG), trading pounded fig bark cloth is still the primary source of cash (1993). Young porter of tree nuts about to leave. (cliché P. Lemonnier)

People like the Ankave continue to rely on the forest for all their dailyaw materials.Making a fibre skirt out of aquatic herbs (Ikundi 1994)(cliché P. Lemonnier)

TwoAnkave women.Their bark capes,fibre skirts and carrying nets are made exclusively from forest products (Ankave, Gulf Province, PNG, 1990). (cliché P. Lemonnier)

3. RELATIONS BETWEEN PEOPLE AND FOREST

3.1 SUBSISTENCE ACTIVITIES .

3.1.1 Hunting and trapping

The Ankave are basically horticulturists despite living in a forest environment and having a population density of 1,3-1,4 person/km^2 - a ratio not much higher than for hunters and gatherers. Although the area is rich in fauna hunting provides only a very marginal nutritional contribution to the Ankave diet. For them game animals primarily fulfil a ceremonial role. Domesticated pigs have an increasingly important role in exchanges between affines but marsupials, cassowaries and feral pigs continue to provide a major element in the gifts which accompany marriage. However, they are not consumed regularly.

The main two hunting techniques are lying in wait and capturing by hand. Birds and tree dwelling marsupials are hunted by lying in wait. For birds, which are killed by day with triple pronged arrows, screens or small huts are built near small ponds where the birds drink, or on the tops of those trees which they visit to feed on the fruit. The nocturnal arboreal marsupials are killed with arrows at night, by the light of the moon when they move along an isolated vine (which has been prepared before hand by the hunter). They are also captured by hand in the tree holes where they sleep during the day. Both marsupials and birds are also caught with spring traps. Feral pigs are either hunted with bow and arrows or captured in large dead fall traps which break their head. In practice such large animals are very rarely captured. Marsupials are the only large game animals regularly captured: for every birth, one or more of them are presented to the woman who has given birth and her friends.

3.1.2 Fishing

Fishing by ichtyotoxic substances is practised only when the water is judged to be low enough to render the damming of the water with wood and leaves successful. This creates artificial ponds where fish toxins can accumulate. Trapping eels, on the other hand, is done several times during the year with success. Dried eel meat is an obligatory gift at the closure of the mourning ceremonies, when the spirits of the deceased are driven away (Lemonnier 1993).

3.1.3 Gathering and semi-gathering

Throughout the year the Ankave have either access to pangium nuts *(Pangium edule*, from April to August) or to the drupes of red (oil) pandanus (*Pandanus conoideus*, from September to June). These fruit trees grow at different altitudes in this territory (600-1000 metres for the first, 600-1500 for the second) and consequently their ripening and thus their harvest is staggered. The nut pandanus (*Pandanus julianettii*) only grow above 2000 metres and are harvested from October to December. The fruit are carried to the village where they are dried above the fire place for one week and then consumed. *Pangium edule* is most commonly exploited in semi-cultivation. Differently expressed, this tree spontaneously grows in an environment rendered suitable by people processing the nuts on the site: some fruit are forgotten and left behind to grow into new trees. The different cultivars of oil pandan are generally planted and are always carefully looked after, particularly as they serve as important territorial boundary markers (Bonnemère, Lemonnier 1992).

In addition to *Pangium edule* and the two pandanus, the Ankave in the Suowi valley also eat the fruits of *Artocarpus altilis* (a tree which is relatively rare), and *Finschia chloroxantha*, as well as numerous leafy vegetables from the forest, and mushrooms. Other than the oil pandanus in season, none of the fruits of these trees are frequently eaten. However, they provide nutritional supplements which, according to specialists are qualitatively important (even if they are quantitatively marginal). All of them are rich in fats and proteins: oil pandanus, 11,5% protein and 66-90% fat (calculated by Sillitoe 1983: 241); *Artocarpus altilis*, 6% protein; nut pandans, 66% fat and 12% protein (Powell 1976 and May 1984). The sago palms growing in the lowest part of the territory are hardly used. Further more, the sauces made from processed fruit of *Pandanus conoideus* and *Pangium edule* form, on the one hand, part of a large scale distribution, and on the other hand, are distributed to parents, consanguines or affines who then organise a collective meal. On a small scale this distribution resembles the ceremonial distribution of pork in numerous regions of Papua New Guinea, but which are otherwise completely unheard of among the Anga. Without intensive agriculture and developed animal husbandry, these modest ceremonial exchanges are largely based on resources obtained from semi-domesticated plants. This constitutes a form of classic 'sociability' characteristic of New Guinea. It has *de facto* an extremely positive effect on dietary balance and is firmly rooted in a distinct way of resource utilisation. Leafy vegetables (*Ficus* spp., *Cyathea* spp., *Diplazium* spp., etc.), mushrooms as well as fruits and nuts (*Dyplocyclos palmatus, Gnetum gnemon, Melothria* sp., *Sterculia schumanniana, Tricosanthus* sp., etc.) are also amongst the products collected on an almost daily basis.

3.1.4 Animal husbandry

Pig herds are not well developed but the number of animals corresponds to the average found among Anga elsewhere. We counted 156 pigs in the Suowi Valley in January 1988. At the time there were 293 people living there (0,5 pigs per resident and 1,5 animals/woman). These figures differ from those obtained in those regions of Papua New Guinea where people ceremonially exchange pigs (or pork) and where herds may comprise several hundred animals. The Ankave do not spend a great deal of time or energy on pig husbandry, because once adult, pigs are only irregularly fed cooked bits of 'Chinese' taro *(Xanthosoma sagittifolium).*

3.1.5 Horticultur e

The basis of the diet is garden produce: 'Chinese' taro *(Xanthosoma sagittifolium),* bananas *(Musa sapientum),* sweet potato *(Ipomoea batatas),* sugar cane (*Saccharum officnarum)* and to a lesser extent taro *(Colocasia esculenta)*. *Xanthosoma* taro was introduced to New Guinea by Chinese porters accompanying German explorers at the beginning of the century (Barrau 1962:105). Although it arrived late in the Suowi valley (1930) it rapidly replaced other staples. However, preferential use of this taro has not greatly altered horticultural practice, where one tuberous staple was simply replaced by another. There are also various leafy vegetables present in the gardens *(Hibiscus manihot, Rungia klossii, Oenanthe javanica*, etc.), cucumbers, the grass *Setaria palmifolia,* and the cane *Saccarum edule,* various cucurbits, and maize in small quantities. According to their location, three types of garden can be distinguished. In the permanent hamlet (*anga xwe,* house/village large) where a family maintains their main residence, they plant sweet potatos, taro *(Colocasia esculenta),* bananas, onions, maize (since the 1970's) and sugarcane in the enclosed domestic area *(anga xwona* house wall) which surrounds the house (fig. 2). In addition, everyone maintains one or two gardens (omugen), varying in size from 2000 to 4000 m^2 (fig. 3). When a man has two gardens he does not plant them at the same time. The more recently established plot provides the sweet potatoes, the grass *Setaria palmifolia* and the cane *Saccharum edule*, of which the undeveloped inflorescence is eaten. The oldest gardens (at least two years old) contains the bananas, sugarcane, 'Chinese' taro *(Xanthosoma sagittifolium),* that is all those crops which have a longer life span and a late first harvest (approximately one year after planting). These large gardens may be situated close to the hamlets (15 to 20 minutes walk) or, in the case of people whose clan territory extends to the lowlands of the valley, gardens may be as much as 2-4 hours walk away.

When establishing a new garden *(omugen sigen*, garden/work new/raw), the Ankave clear a an area in the forest where their parents or grandparents had established their gardens 20 or 30 years earlier. Such a zone of old gardens *(ondzokwi, ondzo'o zone, Trichospermum* zone) is distinguished from the forest where no cultivation has previously

been made (*a'wo*) or the high altitude forest *(a'wo xwe'me*, big forest, deep) by specific tree formations (for example *Acalypha* spp., *Macaranga* spp.) and more importantly by the collective memory which associates the name of an 'elder' (aro'o, white cockatoos), a father, uncle, or grandfather with some palmlilies (some have a stem diameter of 30 cm!), with *a'ki (Comensia* sp.) and with oil pandanus *(Pandanus conoideus)* which continue to be well maintained after the faces of the last gardeners working the site have been forgotten by the living.

The women begin planting as soon as the first trees have been cut (fig. 4). Meanwhile the men continue to clear other areas while they begin to build a protective fence (a task which is rarely completed). The operations last several months, often as many as five or six, because they are almost entirely carried out by a husband and his wife/wives.

After six to eight months the sweet potatoes are gradually harvested, however the *Xanthosoma* and *Colocasia* taros take more than one year to ripen. Of these crops cuttings are replanted during harvesting. Two years after the first planting, and considerably longer if regular maintenance can be assured, the taros can be harvested again. The same applies to bananas and some leafy vegetables (notably *'ara' ja'a*, *Elaeocarpus sepikanus*). As much as diminishing yields (after one and a half years sweet potatoes produce only leaves), it is the struggle against weeds which justifies the abandoning of the garden after three years. Magical practices surrounding gardening activities are relatively limited: a magic formula is spoken when the last large tree is cut, which was deliberately left standing in the centre of the plot. Each nuclear family maintains at all times at least three gardens.

3.2 THE FOREST IN ANKAVE SOCIAL ORGANISATION AND THOUGHT

The Ankave are basically forest people. Whether they occupy a temporary camp in a small forest clearing or in a larger tongue-shaped patch of savanna, the sites where the Ankave establish themselves are zones only a bit different from the forest and where trees have been slightly pushed out of the way to facilitate the creation of a living space for people. For the Ankave, there is no difference between inhabited space and the deep forest.

3.2.1 Resource Tenure

There is no part of the valley which is not identified, appropriated, named and marked. Various forest products maybe collected by all members of a tribe regardless of clan or lineage affiliation: mushrooms, leafy vegetables, vines and timber. Access to game animals is much more restricted. Clan members may freely hunt or set traps in the

vast forest ranges, which normally belong to single individuals. Other men of the tribe are allowed to hunt any game animal they see from a path. Even between brothers, game animals should not be killed without immediately taking it to the man who sets traps in the area or without forewarning him. Certain forest products are reserved exclusively for the person who first finds them or who maintains them, for instance betel palms (Areca catechu), or the figtrees which provide the material for bark cloth.

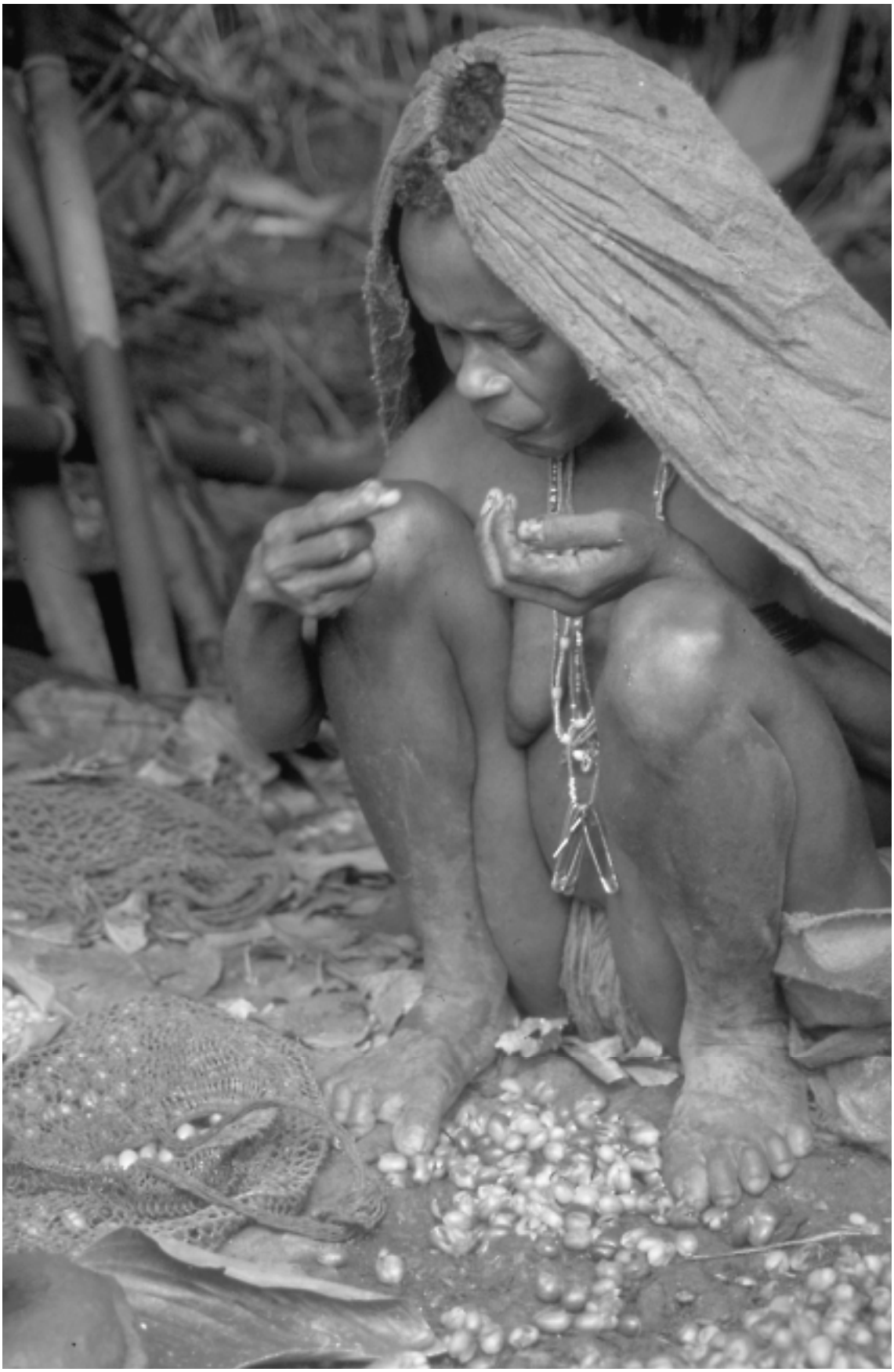
Gardens are established in those forest areas where cultivation took place 15 to 30 years before. Nowadays, this cycle of cultivation may be considerably reduced in the domestic enclosures of the main permanent villages, because people have now settled there for longer periods due to the presence of the evangelist (or of the anthropologists).

The agnatic descendants of the first person to clear an area have free access to it. In practice, fathers divide the garden land between their sons. If a man dies prior to dividing his land then it is the eldest son who will allocate his younger brothers their garden land. As has been indicated elsewhere (Godelier 1969, Lory 1982: 251), it is important to distinguish between the owner's rights to a site and the usufructory rights which may apply to it. To a certain extent a woman can transfer these rights to her husband or her children. However, patrilineal rights supersede this. Cultivation of affinal or maternal lands may only be done with permission. Appropriation of the forest, or more precisely, the rights of its use, are identified by subtle demarcations known by everyone, its markers are oil pandans and Areca palms which demarcate the old gardens as well as the deep forest. When a garden stops producing the Ankave plant oil pandanus (Pandanus conoideus). As oil pandanus do not bear fruit before their fourth year, it is the relationship between soil, food, and lineage which is thus memorialised and materialised over time. The choice of these trees/markers is not an indifferent one. Only certain species are culturally invested with those qualities which make them symbols for rights to the land. This is the case with oil pandans, whose fruit produce a bright red oil which is identified with blood in general and menstrual blood in particular. One of the crucial moments during initiation ceremonies is when this oil is smeared over the bodies of the young boys, who thus acquire their maturity and male force. The same totality of representations thus underlies the theories of personhood, the structure of male initiation, and the demarcation of territories.

The special place eels hold for the Ankave is another one of their cultural peculiarities. At the closing of the mourning ceremony, when the spirit of the deceased is driven away, eels are given to the classificatory cross cousins of the deceased. Of all inherited rights, those related to streams are the most severely restricted and controlled.

Completely known, appropriated, named, the tropical forest is much more to the Ankave than their material support for subsistence and commercial activities. The history that the Ankave have imprinted onto the forest through the generations is also the history of the myths that their ancestors created. Although imaginary, this history provides the

reason for the Ankave's existence. In addition to the marsupials they hunt, the figtrees, the *Pangium edule* and pandanus by which they maintain a large part of their social life, the Ankave are aware of other animals (cassowaries,eels), other plants (red palmlilies, *Elaeocarpus* spp., *Syzygium* spp.) or varieties of plants (the *perengen* cultivar of *Pandanus conoideus*) which are hunted or maintained for their role in ritual life. Cassowary quills, for instance, are used as nose decoration for first level initiates. Palmlilies and some oil pandans are thought to have grown from the blood spilled by primordial ancestors (Bonnemère 1996). These constitute mythical references to various items, including sacred instruments, as well as serving as symbols in male rituals. These forest beings are the reason why the Ankave – as they believe - reproduce themselves identically from generation to generation, being at the core of ceremonies during which the Ankave continue to reproduce their social hierarchies and from which they derive their identity as well as male force and courage.



The Ankave harvested and sold cofee for the first time in meaningful amounts in 1997Here a woman is shelling beans with her teeth (Ankave, Gulf Province, PNG, 1998). (cliché P. Lemonnier)

Ankave garden.After 5 or 6 years only a trained eye can discern traces of old gardens in the forest (1997). (cliché P. Lemonnier)

The Ankave establish their semi-permanent houses in portions of the forest identified by tree markers, such as these "oil pandan" freshly cleared from the surrounding forest. Such tree markers reveal the place of an old hamlet. (Ankave, Gulf Province, PNG, 1997). (cliché P. Lemonnier)

4. «BEING SEEN EVERYWHERE» : THE WANDERINGS OF THE ANKAVE

Ankave society is characterised by residential mobility comprising three types of movement within the tropical forest: cyclical annual migrations and multi-annual garden succession; and non-cyclical but regular long term movements, which for centuries have led the populations to drift from the highlands towards the lowlands, where they are now disappearing (or have disappeared).

4.1 ANNUAL MIGRATIONS

From April to May, families successively leave to set up residence in the lowlands to process pangium nuts for several weeks. In June it is breadfruit *(Artocarpus altilis)* which they consume in the same areas. Oil pandanus, if left to their own, grow at a variety of altitudes, and it is their varied fruiting times, according to species and altitude, which induces the Ankave to shift residence between September and June. From October to December, they move to the highest zones of the territory in order to collect pandan nuts. Eel trapping, the processing of fig bark or the preparation of lime to be consumed together with betelnut, is independent of the season (fig. 5). Clearly, the work invested within the clan territory may be solely designed to reinforce use rights.

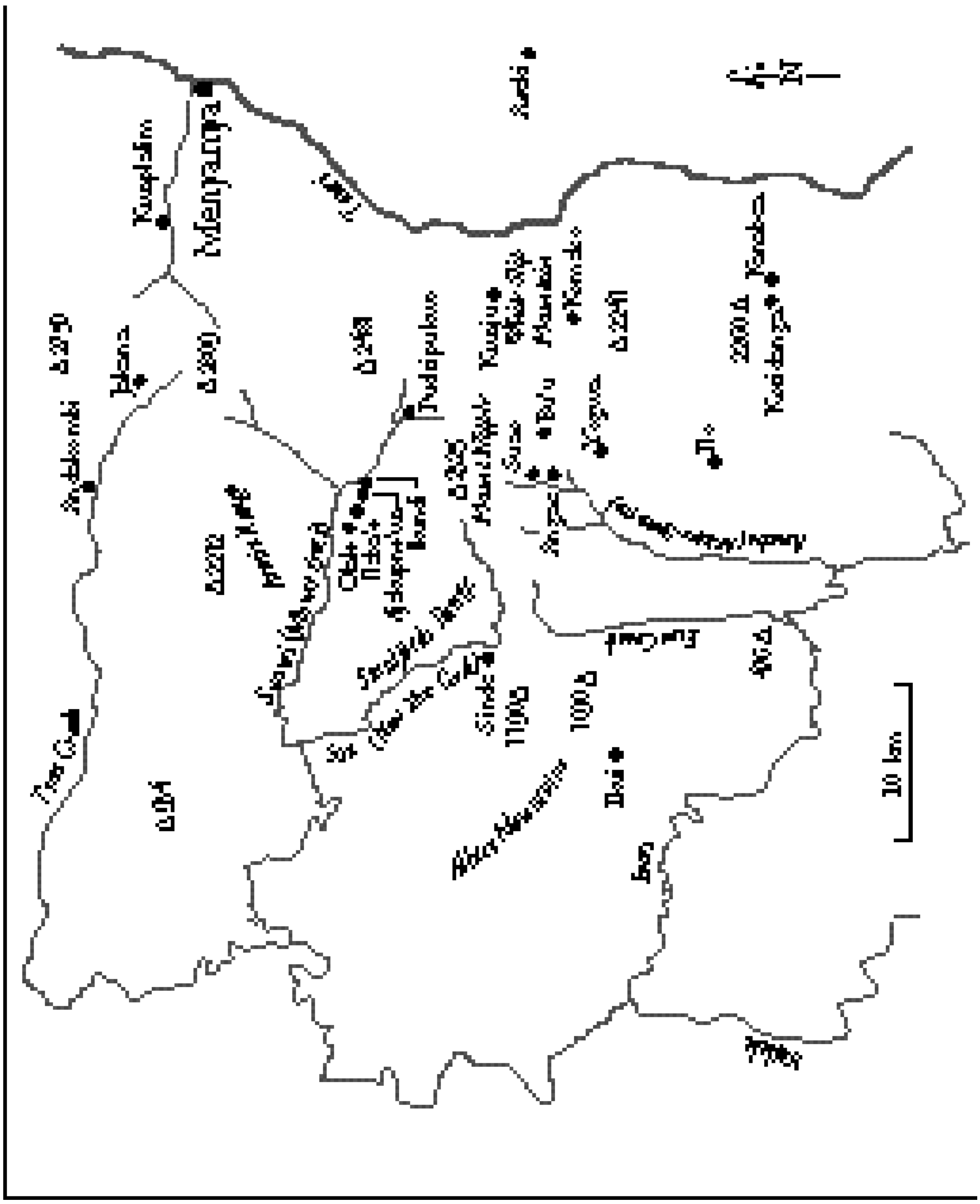
4.2 MULTI-ANNUAL CYCLE

The annual, cyclic, migrations are complemented by another cycle which corresponds to the cycle of the gardens and which extends over several years. When a family establishes a new swidden plot, they frequently clear a portion of their territory situated opposite the former site. This is demonstrated by the residential sites occupied and the gardens established by an Ankave man who between 1984 and 1998 changed his main residence six times and established eight different gardens.

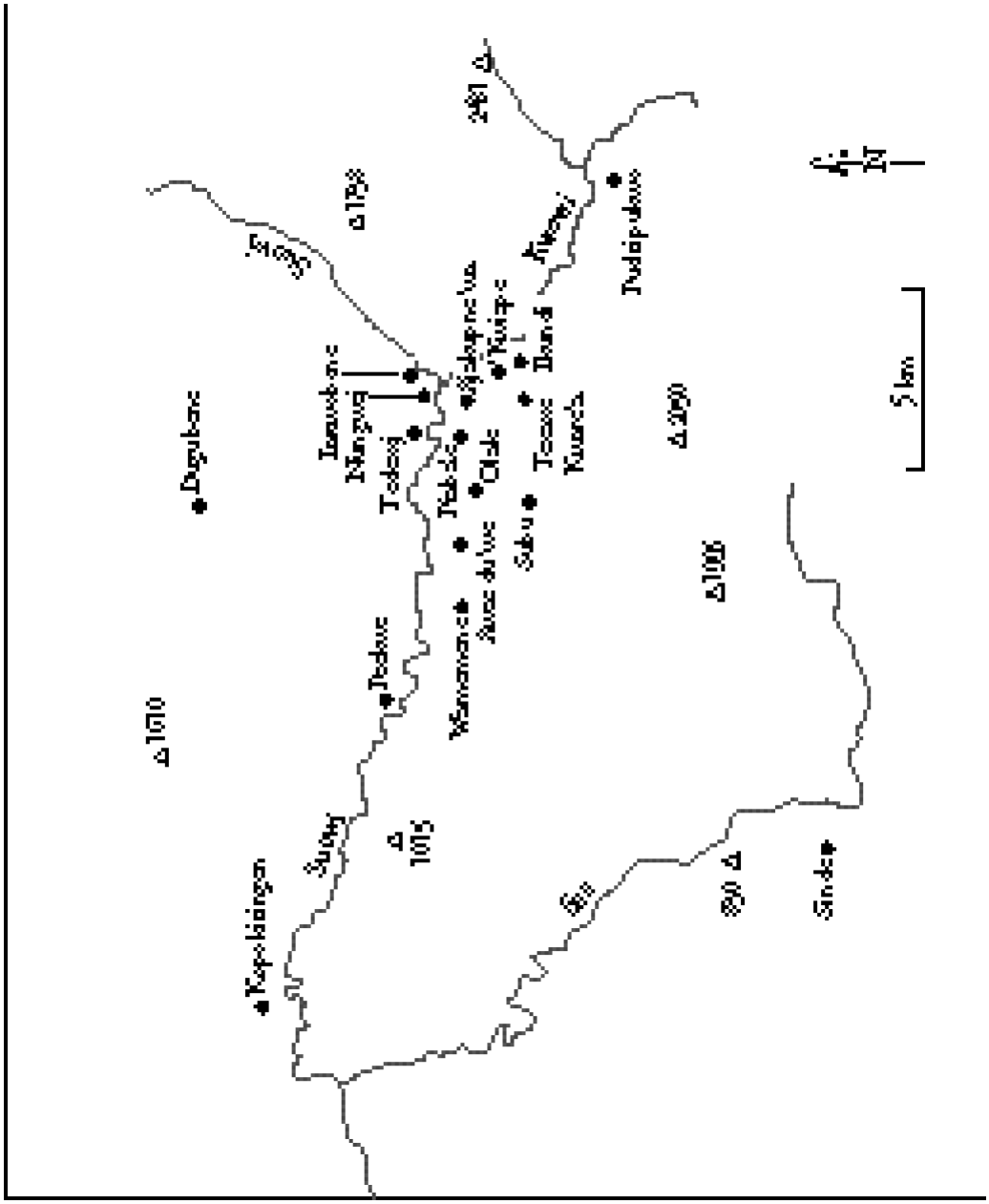
4.3 THE PERMANENT HISTORICAL MIGRATION OF THE ANKA VE

In addition to these patterns of movement there is another pattern of migration which is slower, yet covers a greater geographic area: the ancient migration of the Anga from Menyamya towards the lowlands. Year after year some people leave the zone of hamlets following conflicts or to escape the cannibal witches *ombi* for the extreme west of Ankave territory (Saa, or 'New Year Creek').

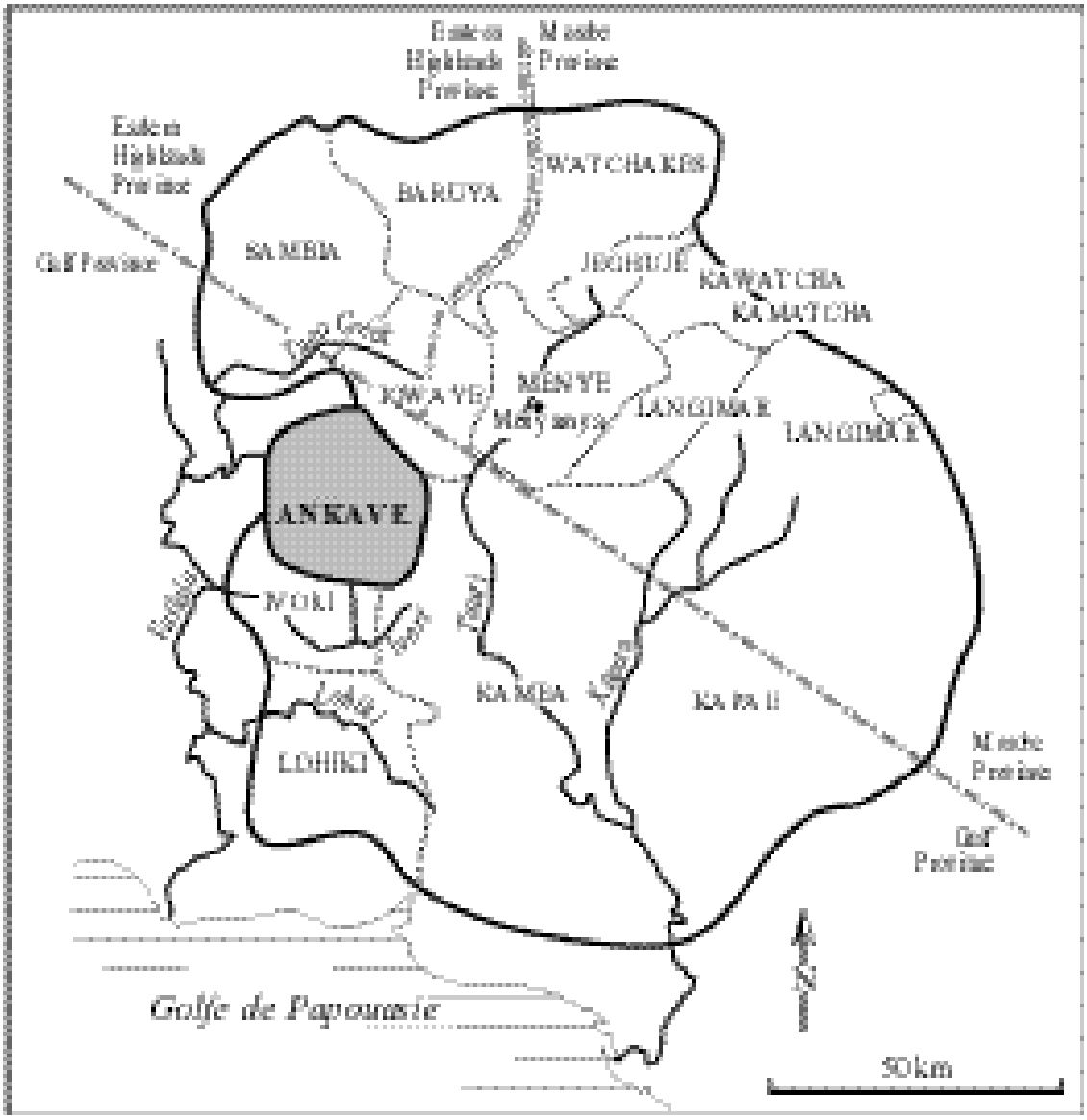
APPENDIX 1: MAPS



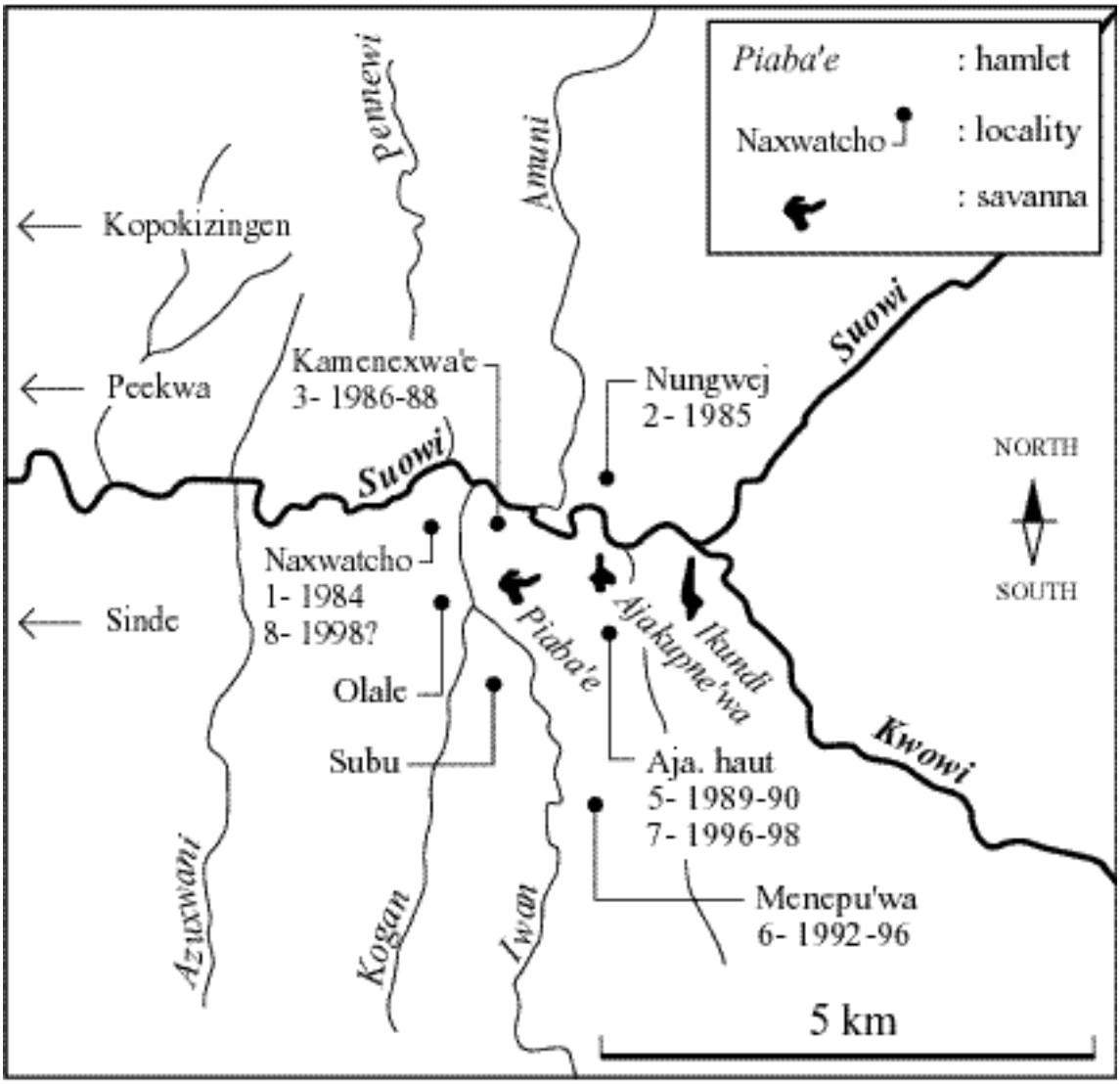
Map 2 : The Ankave Three Valley territory



Map 3 : Suowi Valley (or Mbwei River)



Map 4 :Anga groups



Map 5 :Apatche gardens and residences

APPENDIX 2 : FIGURES

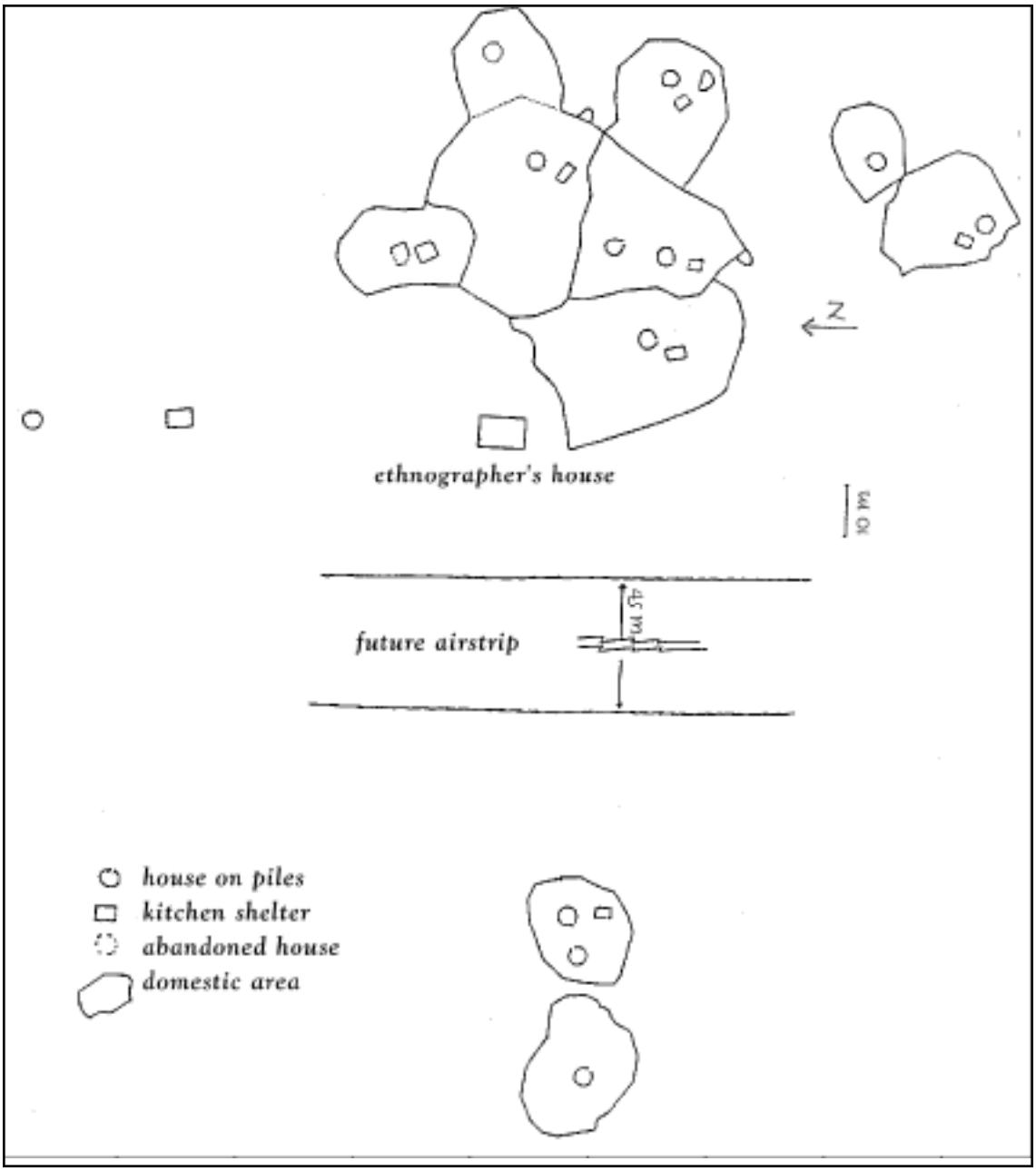


Figure 1 : Central part of Ajakupne'wa hamlet (1987-1988)

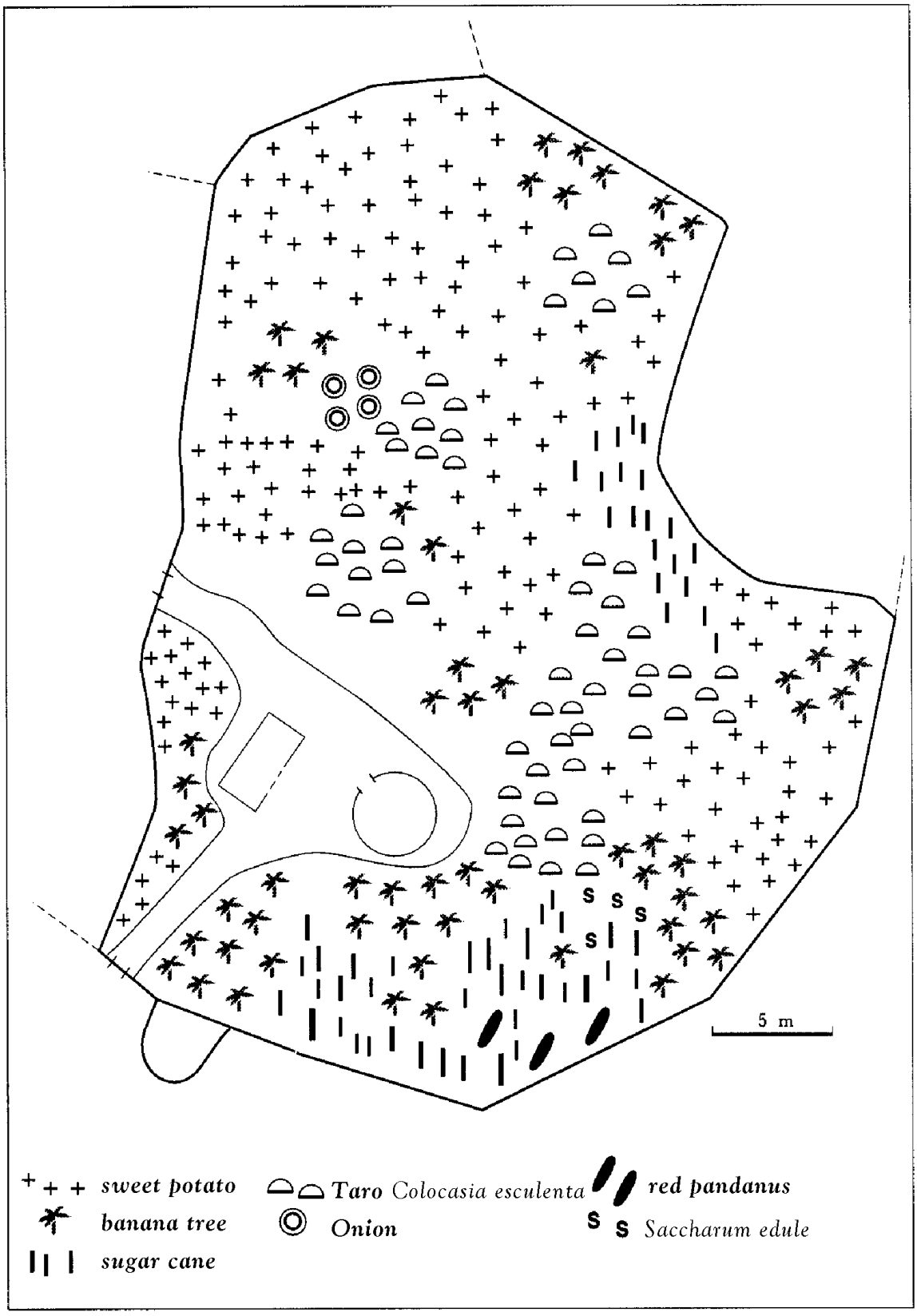


Figure 2 : Domestic area

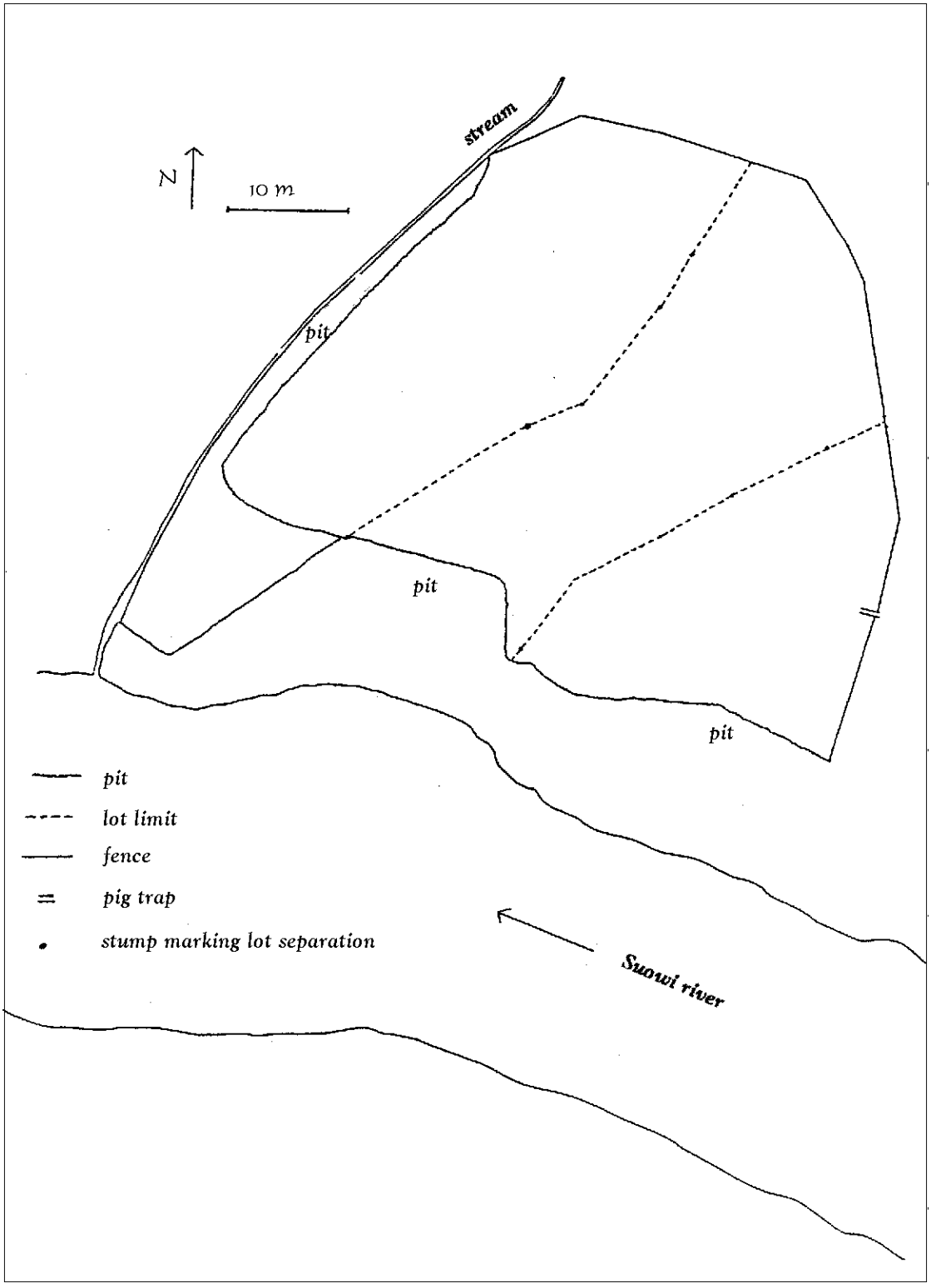


Figure 3 : Garden of a polygamous home (three wives) (1987)

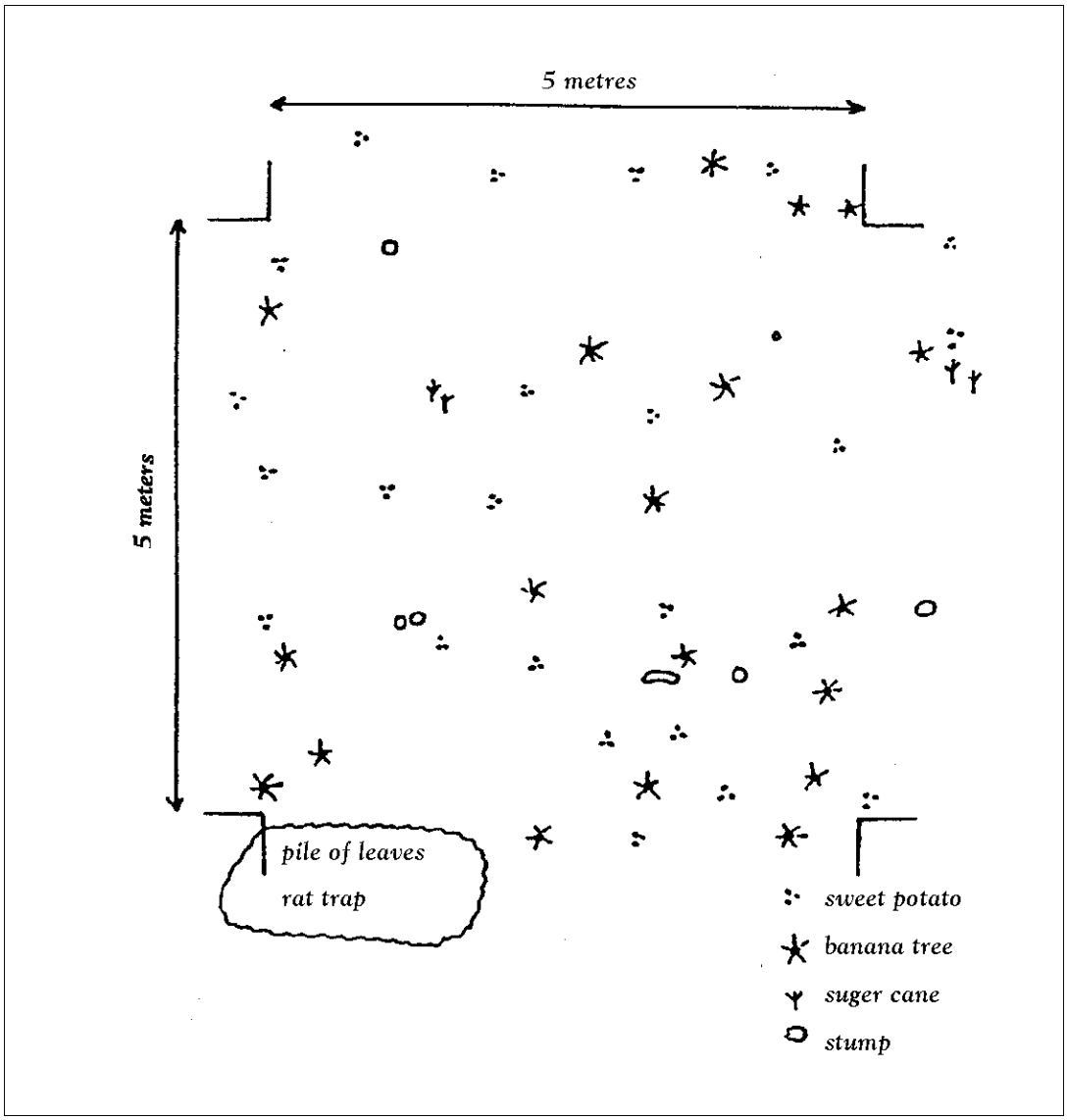


Figure 4 : Density of plants in a new garden

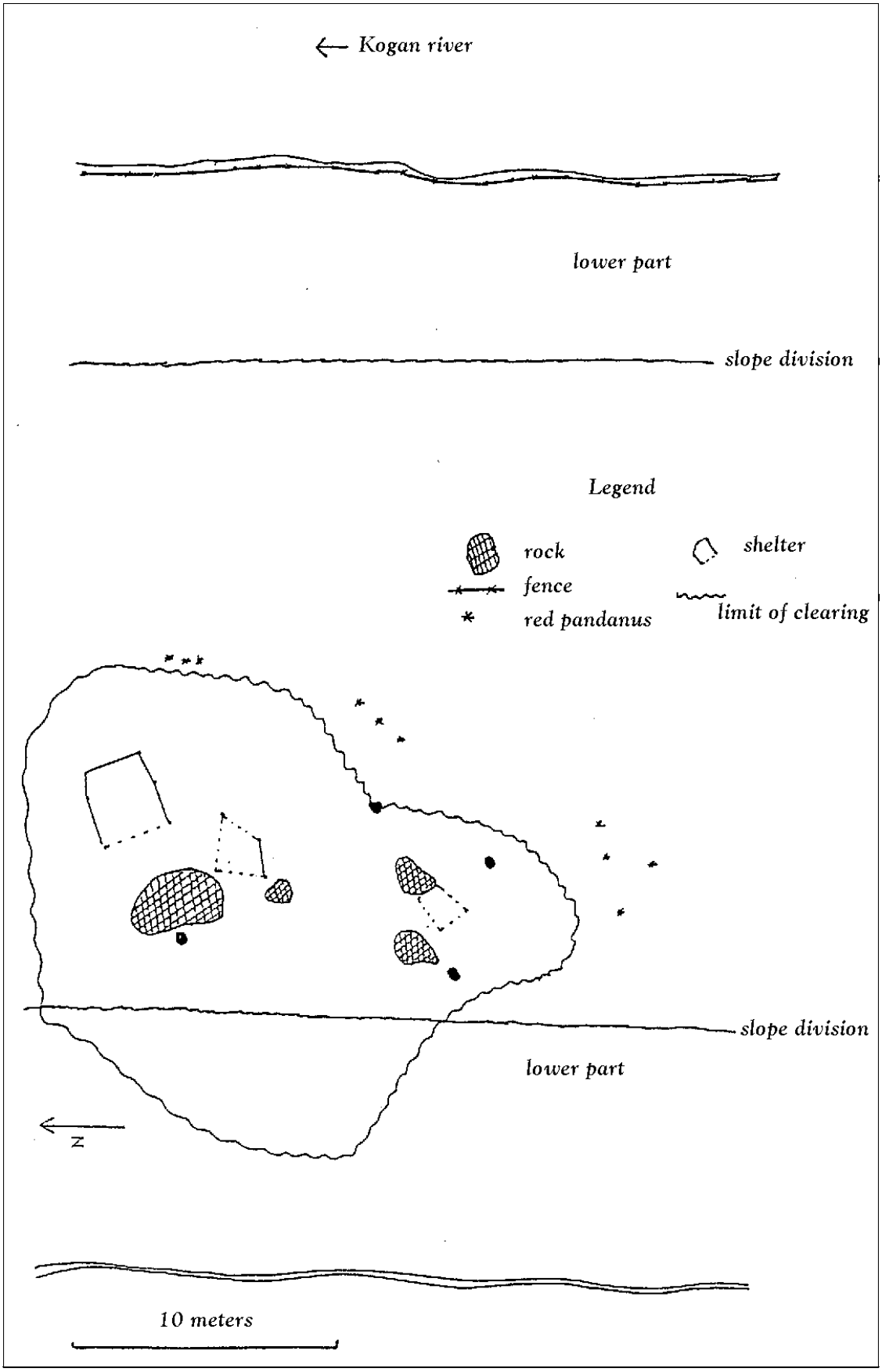


Figure 5 : Temporary camp for catching eels (Kamenexwa'e1987)

APPENDIX 3: TABLES

Table 6 : Localisation of successive Apatche gardens by GPS

1985		
Résidence	Ajakupne'wa	07.17.520 S / 46.388 E, ± 1100 m
Jardins	Nungwej	07.17.248 S / 46.610 E, ± 1000 m
1987-88		
Résidence	Bas de Piabae	± 1050 m
Jardins	Bas Piabae	
	Naxwatcho	07.17.200 S / 45. 885 E , ± 950 m
	Kamenexwa'e	± idem
1989		
Résidence	Ajakupne'wa	07.17.520 S / 46.388 E , ± 1100 m
Jardins	Ajakupne'wa	
	Naxwatcho	
1990		
Résidence	Menepu'wa	07.18.230 S / 46.300 E , ± 1550 m
Jardins	Menepu'wa	
	Abandon du jardin de Kamenexwa'e	
1993		
Résidence	Menepu'wa	
Jardins	Menepu'wa	
	Vers Wangowi	± 1450 m
	Nouveau jardin vers l'aval	± 1550 m
1994		
Résidence	Menepu'wa	
Jardins	Menepu'wa	
1997		
Résidence	Ajakupne'wa haut	07.17.550 S / 46.200 E
Jardin	Ajakupne'wa haut	
	Menepu'wa (dernières récoltes avant abandon)	
1998		
Résidence	Ajakupne'wa haut	
Jardin	Ajakupne'wa haut	
	Menepu'wa (dernières récoltes avant abandon)	
	Nouveau jardin à Kamenexwa'e	

Table 6 a to f:Ankave demographic data (1988-1998)

January 1988

	Men	Boys	Women	Girls	Total
Pudzipukwo	6	8	9	3	26
Ikundi	33	16	36	16	101
ItSewobene	4	4	4	2	14
Subu	3	3	2	2	10
Ajakupne'wa	16	15	21	12	64
Piaba'e	4	8	7	2	21
Olale	12	15	15	13	55
Nungwej	0	0	0	0	0
Texaxe kware'a	0	0	0	0	0
Tedexej	0	0	0	0	0
Peekwe	0	0	0	0	0
TOTAL	78	69	94	50	291

June 1990

	Men	Boys	Women	Girls	Total
Pudzipukwo	4	4	6	1	15
Ikundi	29	20	33	21	103
ItSewobene	6	7	8	4	25
Subu	1	3	1	2	7
Ajakupne'wa	11	12	11	10	44
Piaba'e	6	9	6	5	26
Olale	11	14	14	16	55
Nungwej	2	2	2	1	7
Texaxe kware'a	1	5	3	1	10
Tedexej	1	4	4	4	13
Peekwe	2	0	2	1	5
TOTAL	74	80	90	66	310

March 1993

	Men	Boys	Women	Girls	Total
Pudzipukwo	2	4	7	0	13
Ikundi	24	17	25	20	86
ItSewobene	2	1	2	2	7
Subu	0	0	0	0	0
Ajakupne'wa	23	21	27	12	83
Piaba'e	21	25	24	16	86
Olale	0	0	0	0	0
Nungwej	0	0	0	0	0
Texaxe kware'a	2	3	3	3	11
Tedexej	0	0	0	0	0
Peekwe	2	4	4	2	12
TOTAL	76	75	92	55	298

October 1994

	Men	*Boys*	*Women*	*Girls*	*Total*
*Pudzipukwo**	0	0	0	0	0
Ikundi	25	19	28	21	93
ItSewobene	4	2	4	2	12
Subu	0	0	0	0	0
Ajakupne'wa	22	22	30	12	86
Piaba'e	20	23	24	17	84
Olale	0	0	0	0	0
Nungwej	0	0	0	0	0
Texaxe kware'a	2	3	3	3	11
Tedexej	0	0	0	0	0
Peekwe	1	4	3	4	12
TOTAL	74	73	92	59	298

Nota bene (in French) : Entre mars 93 et octobre 94les habitants de Pudizupkwo sont partis s'installer à Lagai d'où leurs ascendants sont originaires.

June 1997

	Men	*Boys*	*Women*	*Girls*	*Total*
Pudzipukwo	0	0	0	0	0
Ikundi	22	24	30	24	100
ItSewobene	4	2	5	2	13
Subu	0	0	0	0	0
Ajakupne'wa	20	20	24	16	80
Piaba'e	19	18	25	18	80
Olale	0	0	0	0	0
Nungwej	0	0	0	0	0
Texaxe kware'a	3	6	6	3	18
Tedexej	2	4	3	3	12
Peekwe	1	3	1	1	6
TOTAL	71	77	94	66	309

June 1998

	Men	*Boys*	*Women*	*Girls*	*Total*
Pudzipukwo	1	2	1	2	6
Ikundi	24	24	31	21	100
ItSewobene	6	5	6	3	20
Subu	0	0	0	0	0
Ajakupne'wa	20	19	29	14	82
Piaba'e	15	16	15	13	59
Olale	7	4	5	3	19
*Nungwej**	1	4	1	0	6
Texaxe kware'a	4	9	7	4	24
Tedexej	3	3	2	2	10
Peekwe	3	2	3	2	10
TOTAL	84	87	100	64	336

Nota bene :

Un homme d'Angae marié à une femme d'Ajakupne'wa est venu s'installer à Nungwei où certains habitants d'Ajakupne'wa avaient construit des abris temporaires et où tous avaient décidés d'installer leurs porcs.

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SITE OF COMPLEMENTARY LONG TERM RESEARCH

MUSULA / KASUA

SITE DE RECHERCHE COMPLÉMENTAIRE DE LONGUE DURÉE

Florence BRUNOIS

CENTRE DE RECHERCHE ET DE DOCUMENTATION SUR L'OCÉANIE (CREDO)

1. GENERAL PRESENT ATION

1.1 THE KASUA TERRITOR Y: AN INCREDIBLE MOSAIC OF HABITATS

> *The ecological characteristics which are rare and unique at the end of this Millennium reveal the extent to which the presence of the Kasua people, whose existence depends exclusively on the forest ecosystem, has favoured the co-existence of all animal and plant species.*

The territory inhabited by the 550 Kasua is dominated by Mount Bosavi, nicknamed 'the blue mountain'. It makes up the largest tribal territory of the Great Papuan Plateau of Papua New Guinea. Due to its large surface area this territory offers exceptional biodiversity. From north to south, from 1400 m to 40 m in altitude there are three types of forest: lower mountain forest, lowland foothill forest, and alluvial lowland forest. Added to these various types of forest ecosystem are some remarkable freshwater biomes, multiple rock formations and numerous microclimates which all contribute to a mosaic of habitats supporting a rich variety of fauna, with many endemics.

This biodiversity is presently threatened by ill-considered industrial exploitation. Its survival depends on local people's constant attention to sustainable management of the natural resources based on low material appropriation from nature and a knowledge of the forest environment which equals that of modern ecology.

1.2 THE KASUA : A POPULATION IN SEARCH OF SPACE

> *The celebration of numerous ceremonies, such as initiations in which women also participate, are linked to the forest environment and its regeneration. These ceremonies provide an opportunity to reiterate Kasua identity.*

Generous spatial arrangements are characteristic of the Kasua and perhaps mimic the territorial behaviour of the cassowary, their namesake. Indeed, the quest for space was the reason for this Kasua separate identity. 80% of the patrilineal clans which today make up Kasua society are descended from Kaluli lineages which had migrated into virgin territory following conflicts over access to resources. Some of these clans established themselves to the north east of Mount Bosavi, while others migrated as far as the lowlands to the south. The expansion of their tribal boundaries can be seen in their

linguistic affinities. The inclusion of the Kasua language in the Bosavi language family shows its origins, while a strong multilingualism which includes ability to speak Fasu, Hivalo and Kamula languages, suggests maintenance of contact through war and ritual. Tribal cohesion has not, therefore, suffered from territorial expansion but was rather enriched by it. Further, this cohesion was also unaffected by a dispersed rotational residential pattern (2-3 years). Several patrilineages are grouped around a 'great house' which links them to each other through kinship and marriage. Consecutive internal vendettas resulting from witchcraft attacks, head hunting and child kidnapping were additional unifying factors.

> *Within this essentially egalitarian society collective initiatives demand the co-operation of the entire population.*

1.3 THE RAPID OPENING -UP OF KASUA TO THE OUTSIDE WORLD

Only with modernity has geographical distance translated into real social distance. At the end of the 1960's, while the southern clans were avoiding all contact with the external world, the northern clans, only three days walk away, had converted to fundamentalist Protestantism, founded the village of Fokomayo and were taking advantage of new consumer goods.

The exchange of sisters (the preferential marriage pattern) with the southern clans is forbidden to members of the Northern clans, because the Southern clans are said to practice satanic rituals. It was not until 1984 that the mistrusted Kasua of the south restored their image by inaugurating the first airstrip in the tribal territory at the base of Mount Musula. This assured them access to the outside world. A progressive regrouping of some clans followed. This regrouping culminated in a 1996 meeting of 10 clans and 170 people (of which 105 were children), when, under the authority of the Evangelical Church of PNG, the ECP station of Musula was set up. This station houses a small infirmary, which provides first aid, though through a somewhat random supply of medicine, and, as of 1991, the first and only primary school in Kasua. Fifteen kilometres west of Musula, four clans, comprising 30 individuals, have regrouped to found the small village of Walio. There is no medical, educational or transport infrastructure. The acceleration of the social transformation of the southern clans was the result of pressure imposed jointly by their pastor and by representatives of logging companies, as well as by officers of the Forest Authority, who have increased their visits since 1979. Different as these actors and their areas of interest are, their goals converge: the separation of the Kasua from their forest. This economic and ideological logic, which promises the Kasua

a ‘modern’future, is widespread throughout the region. It drove the last resisting clans to join the villages.

> *The pastor promised the Kasua that if they would leave the forest, the home of Satan, they would receive the fruits of civilisation, presented as the gifts of God. The logging companies were presented as the representatives of God. They confirmed this promise by adding that when they had set up their bases on the land the Kasua would receive a great deal of money and modern infrastructure.*

However, this incentive for sedentarisation did not put an end to the traditional way of life of the Kasua! Used to a great deal of mobility and dispersion, which has earned them the name ‘forest dogs’ in the past, they regularly abandon the villages to move to their respective clan territories. Within these forest areas, rights to which are transmitted from generation to generation in the male line and which vary between 200 and more than 900 km^2, the Kasua reproduce themselves and draw all their means of existence, both material and spiritual.

> *The forest, elevated as future capital, is and has always been at the heart of Kasua identity.*

2. THE KASUA'S EVERYDAY LIFE IN THE FOREST

2.1 THE GROWTH CYCLE OF SAGO PALMS DEFINES THE ROTATION OF FOREST CAMPS

> *A meal without sago is not a proper meal for a Kasua. The language reflects this identification: the sago palm, the verb « to eat » as well as food in general are all referred to with the same term, « ma:ne ».*

The Kasua's mobility is primarily dictated by the growth cycle of the sago palm. The starch they extract from these palms forms the basis of their diet. At present every clan has on average thirty sago stands which are distributed equally between brothers. A sago stand or a single palm may be the object of exchanges which form part of the management of this resource.

> *The Kasua do not cultivate sago palm. However, they recognise 13 landraces. Moreover, the practices of redistribution as well as the extreme mobility of humans prevent the loss of this vital resource.*

The abundance of this resource obscures one constraint: the ideal time for felling the palms is when their trunks are full of starch just before flowering, which precedes the death of the palm after about fifteen years of growth. Missing this optimal time means losing nearly three weeks' food supply. Consequently, everyone who walks through the forest attentively observes the growth stage of wild sago palms. The forthcoming flowering induces the owner and his family to move near the swamp where the mature palm was spotted. If several sago palms are mature and have to be cut at the same time, or if the trunk of a single palm is considered too large for one family unit, several consanguines or affines will join forces. They set up temporary camp in the forest at a walking distance of thirty minutes to two days from the village. From this temporary settlement men and women organise their forest activities for several weeks.

2.2 Food extraction from sago palms

Two days are enough to process a palm trunk which on average may yield more than 60 kg of sago starch, which will ensure the nutritional requirements of a nuclear family for a period of 15-20 days (thus about 25 palm trees are felled per year).
The nutritional contribution of insect larvae from the sago palm is essential to children's diet: 100g contains 6,1 g protein, 461mg calcium, 4,3 mg iron.

The men's contribution to the extraction of sago starch is limited to two actions at the beginning of the process. They perform (a) a ritual which allows (b) the cutting and felling of the palm. Once the palm is cut the men disappear into the forest while the women prepare the work place and the necessary devices for processing the sago starch. Most materials used for this process are taken from the felled palm itself. The extraction is a twofold process: the first phase consists of extracting the pulp from the whole length of the cut and split trunk with the help of a sagopounder. In the second phase the extracted fibrous pulp is soaked in water and then kneaded thoroughly with the hands. A whitish liquid seeps into a trough placed under a filter. When the trough is full the water is emptied and the sago starch remains as a sediment at the bottom of the vessel. According to the quantity collected and the requirements of the family, part of the produced starch may be distributed or is stored tightly wrapped and buried in a swampy place. Before leaving the extraction site, the women set aside the palm fronds which have multiple domestic uses: production of a salt substitute, skirts, food containers and roofing material. Finally the women do not leave before inspecting the trunks of previously felled palms for the larvae of longicorn beetles which develop in them. As soon as the sago extraction is finished the gathering begins!

2.3 Gathering activities

The Kasua distinguish 1422 uses for 550 species of identified plants:
from 122 species fruits or leaves are consumed, 275 are used for construction purposes, 120 have medicinal and ritual uses, 102 are used for food gathering activities, 53 yield fuel, 99 are used to manufacture items and implements, 34 serve as ceremonial decorations, 72 host edible insect larvae, and 483 are known as food plants for animals which thus serve to disperse their seed.

Gathering activities take women and young children several kilometres each day into specific areas. These trips are never random. They are guided by an intimate knowledge of the distribution of tree species within the territory. The sites visited may be quite varied because the Kasua have numerous uses for plants. Actually every tree has a use. If a species is known to be infested with ants and its timber and leaves are therefore unsuitable to use, it is prepared as a breeding site for longicorn beetles, the edible larvae of which are later collected.

These forest trips also offer opportunities for small scale opportunistic hunting. This is an activity in which young boys, armed with their first bow and arrows, are both enthusiastic and proud to engage. Every small animal becomes prey. A stream may be blocked in order to capture small fish and prawns by hand. Every incubation mound of megapodes discovered along the way is searched for eggs. The sandy beaches along the rivers are beaten with a wooden stick to discover turtle eggs. The gathered produce provides more than 60% of the daily protein supply in the children's diet.

2.4 Predation: hunting and fishing

As with gathering, hunting and fishing with bow and arrows or with spears are not random affairs. Such activities which make use of weapons are restricted to men. They too are guided by a precise knowledge of the terrestrial and aquatic environments and the territorial and feeding habits of the animals living in the area. Kasua men do not engage in opportunistic hunting as young boys do.

The favoured strategy is solitary hunting or fishing by hiding or with a lure. These activities can only be done on one's own clan territory because it is strictly forbidden to hunt or fish on another clan's territory. If this is done one risks paying high compensation. The layout of each territory limits the availability of those animal species whose ecological niche lies outside that territory. This procedure applies to 103 bird species, to three different cassowaries, to the 14 largest mammals (of a total of 41 identified mammals), to the 30 large reptiles and to 16 of the 44 known and named fishes.

> *Of the 33 game animals killed in the course of a forest hunt by 11 Kasua: 51,5% were taken at lures, 12% killed during another activity, and 33,5% were flushed out by a dog.*

This strategic choice forces the Kasua to travel the entire extent of their territory systematically in order to survey the development and ripening of fruit on the 82 species of trees on which prey animals feed, as well as to check the presence or absence of animal tracks. If tracks are present then a man will wait near a tree or set up a hide made of palms and leaves, where he will - armed with bow and arrows - patiently wait for his prey. Or using another technique and knowing the identity of the prey, a man might build a trap or snare along the path of the animal. The efficiency of these techniques is near to 85%. However, if, during the course of a journey, a dog flushes out an animal the man will pursue it. Upon his return he will not fail to publicly declare that the catch is the exclusive hunting trophy of the animal.

Capturing fish with a bow and arrow demands as much mobility as patience. The choice of fishing technique and the type of spear chosen is adapted to the fish desired and its behaviour, the characteristics of the water, its depth and current. Finally the adjacent vegetation is also taken into consideration, because the fruits on the overhanging branches of some trees may be used as lures. However, the Kasua prefer collective fishing to these solitary fishing techniques. Collective fishing using ichtyotoxic substances involves 28 species of fish and success is guaranteed. The Kasua eloquently describe it as ‘killing the water’ using either the sap of 20 different roots or the juices of bark which all contain a poison which is toxic to fish. To assure success the master of the site must perform a ritual before mixing the liquid and raising the dam. The effect of ‘killing the water’ is immediate: in the low altitude areas more that 300 stunned fish float to the surface. The men shoot the larger fish with bow and arrows while the women and children scoop the remaining fish by hand.

> *98% of game meat is offered to the parents-in-law within the context of the exchange which defines the relationship with them: bride price, birth of a child, nose piercing of adolescents, mourning.*
> *The bones, the hide and the claws of animals are also used. The Kasua distinguish 43 uses for them: 32,5% are used for the manufacture of weapons, tools or containers, 18,5% for ceremonial decorations, 49% for ritual activities associated with hunting and gathering activities. Only the bones of two fish have ritual characteristics.*

The distribution of the returns of the catch or hunt is governed by dietary restrictions and social obligations. Children, adolescents and pregnant women (actually those to whom the gathered goods are destined) may not consume game meat and three species of fish. These foods would hinder their growth and development. These

categories of person are considered too fragile for such powerful meat. Furthermore it is strictly forbidden to combine different kinds of meat in one meal, infraction risking serious illness. Part of the catch is smoked and given to affines, who, if not considered, would have the power to kill the children of the spouse.

2.5 THE TRAVELS OF CULTIVATED PLANTS AND DOMESTICATED PIGS

The richness of wild products used by the Kasua and the ecological conditions which are so favourable for the growth of sago palms explain the minor importance accorded to horticulture by this population. The area of cultivated gardens covers, on average, only 762 m^2, cleared with a 'slash and mulch' technique. The men, after having performed a ritual, fell the remaining trees on top of the gardens, which have already been planted by their spouses.

> *The 'slash and mulch' technique has the advantage of being perfectly adapted to local climatic constraints. The shade of the canopy ensures the rooting of transplanted stock by protecting the plants from drying out while the felled trunks protect them from the heavy rains, provide organic matter and obstruct the access of the pigs.*

Kasua gardens look very disorganised, like the forest. This is reinforced by the absence of weeding except at the base of oil pandans. This demonstrates the cultural importance of this crop which, in the past, marked the two stages of the initiation cycle.

> *The pattern of cultivated plant diversity demonstrates their relative significance in Kasua society. There are 18 banana cultivars, 19 oil pandan cultivars, 5 bamboo cultivars, 10 sugar cane cultivars, 10 vegetable cane cultivars, 6 sweet potato cultivars, 2 manioc cultivars, 10 different leafy vegetables, and 7 cultivars of hibiscus spinach.*

Owners visit their gardens at the end of the sixth month after planting. The harvest is shared with members of the family and is offered to every visitor to indicate friendship and the absence of animosity. The productivity of these swiddens slows down at the same pace as the pioneer trees appear. The presence of certain pioneer species, said to be 'planted' by cassowaries, causes the Kasua to abandon their gardens, because they say that the animal has taken back the site. The field is left to fallow. This rule has become mandatory and forces the Kasua to move on several kilometres in order to open up new swidden plots, where they plant the remaining cultivars of the old garden. This cultivated stock, which travels from swidden to swidden, marks a certain continuity in the horticultural cycle.

Pig husbandry must not impinge on the spatial mobility of the Kasua. The pig to human ratio is 1:1,53. The pig density per km² is 0,003.

Domesticated pigs and plant stock are treated somewhat similarly. Either captured in the forest or purchased from the Huli people of the Highlands, the piglets are carefully looked after by the women who are responsible for assuring the domesticating process. After three months of captivity the owners give the pigs names, which in 96% of cases refer to a site within the respective clan's territory. In order to further distinguish them from feral pigs, their ears are cut. Each clan has its own design for cutting the pigs' ear which resembles a feature within the clan's territory. Finally the males are castrated. The testicles and the cut parts of the ear are placed inside the house. Piglets, like the planting stock from old gardens, should root themselves in the territory of their masters prior to being released. After having 'taken good root', they are left free in the sago stands of the forest. Their foraging suppresses the underbrush and their presence attracts feral pigs seeking mates, which is the only means of ensuring livestock reproduction. The ways in which the Kasua use pigs is much the same as the situation regarding garden products: 51% are destined for bride price, 20% for the celebration of ceremonies, 11% for sale in the market (since 1995), and 7% as live gifts to consanguines to discharge obligations. Less than 10% of the pig production is destined for personal consumption by the owners. Pigs do not allow the displacement of their owners. This freedom in spatial mobility is a principle to which the Kasua are profoundly attached. It contributes to the realisation of another major principle, that of leaving no traces of their material activity. Simply flying over Kasua territory demonstrates this principle - the tree tops form a unbroken ocean of vegetation.

3. THE PERCEPTION OF THE FOREST ENVIRONMENT

3.1 SPIRITS RESIDE IN THE SHADOW OF THE CANOPY

> *The Kasua recognise that they owe everything to the forest spirits: their means of reproduction – the human sperm – as well as their means of survival. The spirits are the origin of all life and deliverer all game. Their debt to the spirits is enormous.*

Respect for such an attitude is based on a cosmological perception which assumes the notion of a closed circle of energy, a close relation of reciprocity between life and death as well as in all relations between humans and spiritual beings who are the masters of their clan territory. This cosmological exchange places humans as eternal debtors. It affirms the pre-eminence of the spiritual over the real. The number of sites made sacred by the presence of a spirit (160 over the territory of just the 12 clans) and their dispersion within the heart of clan territory is a measure of this omnipresence. Their effective omnipotence is based on another aspect of Kasua cosmology. Spirits can intervene at will in real life by taking on the form of any animal, plant or mineral. A Kasua walking in the forest is never sure of the true identity of the beings he or she meets. As a result, every act of subsistence involving food becomes dangerous. This explains why every initiative is preceded by a ritual asking for legitimisation by the spirits. Moreover, the Kasua do not pursue opportunistic hunting unless the responsibility may be given to the dog. Further, the Kasua only hunt hidden in a shelter, and only following a dream granted by the spirits of the territory, or following a shamanic seance during which the spirits of a particular location have indicated where game animals might be found. In this way the death of an animal, considered to be a gift of game from the spirits, will not result in the death of the hunter but in a counter gift to the spirit which consists of leaving a bit of meat at the base of a sacred tree.

> *If the animal killed was, at that precise moment, the manifestation of a spirit, then the hunter or his children will be the victims of reprisals.*

This relation of exchange of proper cannibalistic features drove humans to respect a very rigorous ecological ethic. They hide and stay under the shade of the tree canopy - the abode of spirits - which a myth formally forbids to open up. Sunlight will lead to the death of all forms of life.

The Kasua measure their actions in the forest carefully because all material appropriation marks indebtedness.

3.2 THE CASSOWARY'S GARDEN : ECOLOGICAL KNOWLEDGE OR THE PRAISE OF A BIOCOENOSIS

According to the Kasua the cassowary is the true horticulturist of the forest. The forest is the garden of the cassowary.

This cosmological context which exerts strong restrictions on a population which feeds exclusively off forest products has favoured the development of a profound environmental knowledge. In fact, this rich knowledge accumulated over the centuries is remarkably accurate, and constitutes the core of Kasua mythology. More than 95% of myths have naturalistic significance. The subjects are as diverse as they are varied: the distribution of faunal and floral elements over the different ecological niches, the necessary spatial separation of certain species which are too similar to each other and would therefore fight over habitat, their feeding habits, their habits of defence and of reproduction. The totality of this knowledge has produced a holistic view in which every species in seen in an interdependent relation contributing to the regeneration of the forest. According to the principles which govern the economy of cosmological exchange, the relations between living beings are governed by a system of exchange of subsistence reciprocity within a defined territory, which corresponds to the clan's territory.

Special emphasis is placed on the interrelations between species from different domains: on parasitism, commensalism, on the role of animals as seed dispersers (for more than 483 trees) and symbiosis (for which the cassowary provides a paradigmatic example).

Kasua thought is ecosystemic in the classic sense of the term. Consequently, we can find in their body of knowledge the same three biotic divisions as defined by western biology: producers, consumers (herbivores, frugivores, carnivores), and reducers. The role of the earthworm, for example, is featured in several myths because it is the best decomposer to reintroduce corpses into the food chain. On the other hand, like the terrestrial crab, able to oxygenate the soil. Several animals are described as secondary producers due to their ability to produce food for other animals.

> *The Kasua are aware of their role within the overall food chain and are therefore also aware of their responsibility. Their ecological knowledge has important implications for applied conservation, being in some respects more insightful than western ecology.*

All food chains are thus recognised, and humans participate in this generalised exchange, and may in turn be cannibalised if they disturb the equilibrium of the real and the invisible system.

4. THE FUTURE OF THE KASU A

My field work with the Kasua consisted of learning and legally acknowledging their exceptional ecological knowledge which have assisted the survival of a unique biodiversity. This intervention was labour intensive because it came much too late. Taking advantage of a favourable religious context and the support of the young Papua New Guinean government in need of financial funds, two logging companies - Wawoi Guavi (since bought out by the Malaysian logging giant Rimbunan Hijau which controls about 50% of Papua New Guinean timber exports, Filer 1997: 217) and Turama Long Term Trading Forest Industry - obtained in 1986 and 1991 concessions to the entire forest belonging to the Kasua. It took no more than half an hour to gather the signatures (or crosses) of the southern clans. It took the same time to repeat the numerous development promises and to cynically give them a two Kina note (about E 0.80) as proof of the wealthy future awaiting them.

> *In 1991, an investigatory commission on the forest industry of Papua New Guinea headed by Judge Thomas Barnett denounced the illegality of the Kasua forest contracts and exposed the general corruption of the ministers in charge of the logging industry.*

The companies still pursue their business while the state of PNG sets up more rigorous regulations and creates a forestry authority whose objectives are, "management, development and protection of national forest resources and the environment, in such a manner as they are conserved and renewed for future generations." In 1994 the Kasua realised that none of the promised infrastructure had been put in place. Feeling tricked they decided to revise their contract. Wawoi Guavi was alarmed and therefore invited them to the capital in order to ‘grease’ them, using the Kasua term. They threatened them with the end of the world by using a widespread millenarian discourse (see Brunois 1999a, Kocher Schmid 1999). The contract was not revised. In 1996, Wawoi Guavi effectively began non-selective resource extraction in Kasua territory. Very quickly, the excitement of the first months which was stimulated by the payment of royalties was replaced by fury. A sacred site which had been pointed out to the company had been destroyed. The owner of the clan territory pushed me into studying the site of where operations where ongoing so that I might be able to testify as a scientist on the variety of ecological and social damages resulting from the logging operations. The results of this research were assembled in a report which the Kasua have handed to the voluntary solicitors of the non-governmental organisation ICRAF (Individual Community Rights

Advocacy Forum -see Brunois 1999b). At the request of the population a court action has been initiated to revise the contract of the logging concession and to demand compensation plus interest based exclusively on our ethnoecological research.

> *My fieldwork was in accordance with the Forestry Act (gazetted June 1992) which replaced the old Department of Forest with the National Forest Authority: "the encouragement of scientific research on the resources of the forest in order to contribute to an ecological equilibrium." The legitimacy of our intervention is thus accepted and even solicited.*

As, from the beginning of these dramatic events there was a contract, the Forest Management Agreement, which the indigenous group recognised by the constitution of Papua New Guinea as the unique owner of the forest resources must sign, there is reason to believe that the situation might improve. By legal definition, a contract is not valid unless all parties consent to it. The local populations are consequently within their rights to impose their ecological preoccupations and make it conditional upon their consent. Ironically, they are even encouraged to do so by the Forestry Act. Article 46 recognises that "the rights of customary owners to their forest resources should be fully recognised and respected in all transactions affecting those resources". ICRAF has become involved and has developed a project of a contract from the Forest Management Agreement which the landowners can impose on the State as well as on logging companies. This initiative is still in a preliminary phase because the solicitors are waiting for the contribution of other specialists. This call for contributions presents a marvellous opportunity for APFT. Working within a legal framework so ideal for our intervention, the body of our systematic research in ethnoecology could produce a more concrete application for a better Future for the Forest People of Papua New Guinea.

A promising legal case for APFT Papua New Guinea:
The Supreme Court of Papua New Guinea found in favour of the owners of the Warongi lands in the case of the State versus the two logging companies on 28 April, 1999.
For the first time the Supreme Court has condemned the illegality of the contracts presented to the populations and recognised the consecutive damages of their illicit exploitation of their territory. The State and the two companies incriminated were ordered to pay 2.3 million Kina (about E 920.000) in damages and interest. This decision comes at a time when the present government is selling off the forests of Papua New Guinea. The government has ceded an extension of southern Kasua territory to the giant logging company, Rimbunan Hijau, measuring 800.000 ha, and is proposing 17 further concessions. It has considerably reduced the budget of the Forestry Authority responsible for controlling forest rights.

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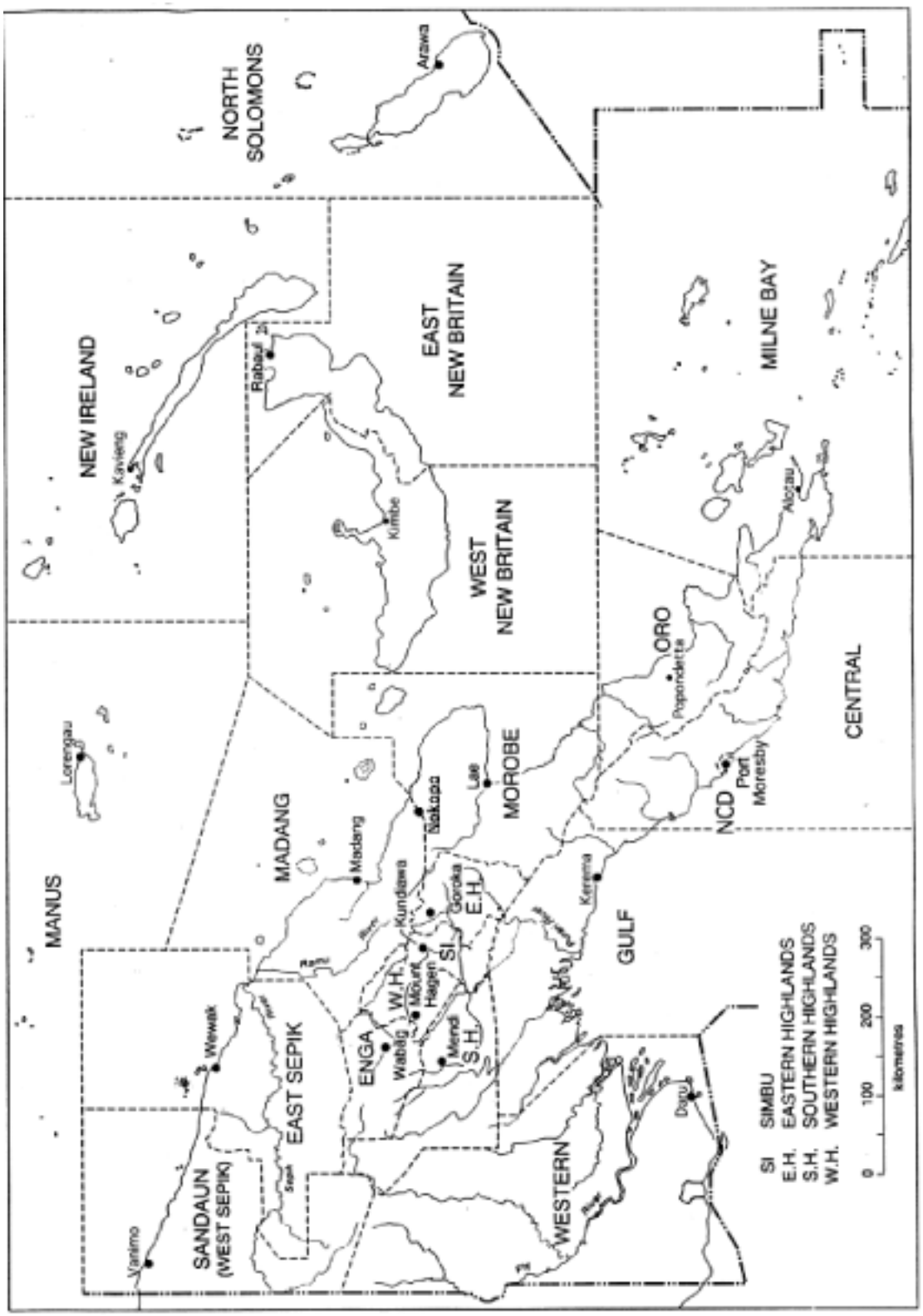
SITE OF COMPLEMENTARY LONG TERM RESEARCH

NOKOPO / YOPNO

SITE DE RECHERCHE COMPLÉMENTAIRE DE LONGUE DURÉE

Christin KOCHER SCHMID

FUTURE OF RAINFOREST PEOPLE (FPR)
PAPUA NEW GUINEA (PNG) WORKING GROUP



Location of Nokopo village within Papua New Guinea

SUMMARY

Demographic pressure combined with changes in land management systems constitutes, in the absence of logging and mainly in the high altitude areas, a serious threat to the conservation of Papua New Guinea's forests. In Papua New Guinea the growth rate of the population is seriously underestimated. Three times during the last ten years a census of people and pigs was carried out in the remote high altitude village of Nokopo. This case study illustrates the importance of a careful investigation into traditional land management before changes are recommended and before the effects of population pressure on a forest environment become evident.

RELEVANT POLICY AREAS

Conservation, tropical forest, environment, poverty reduction

LESSONS LEARNED AND RECOMMEND ATIONS

Even slight and seemingly beneficial **interfer ences with traditional land management** practices may have severe and **destabilising effects** . Although the decrease of pig numbers has reduced the pig disturbance of the forest, the need for money to buy tinned meat to replace pork has increased accordingly and has led to more land being intensively used for cash cropping.
The **official figures for population gr owth** in Papua New Guinea **are too lo w**. They are based on the National Census 1990 which was inadequately carried out. With a rapidly growing population and a shortage of arable land, the pressure on forested land is increasing.

Boy with his bow and arrows in the forest (cliché : C.K. Schmid)

NOKOPO

Nokopo village is situated at an altitude of 1900 m ASL in the Finisterre mountains on Papua New Guinea's Huon Peninsula. The area is remote, straddling the border between the Madang and Morobe provinces, and only accessible by plane or foot.

Demographic pressure and an outside induced change in pig management techniques have been the most significant factors for development and change at Nokopo in recent years.

> *The annual growth rate for the population at Nokopo is 4,8% while the officially recognised annual growth rate for Papua New Guinea is 2,3% based on the inadequate 1990 National Census.*

Between May 87 and September 97 the population of Nokopo grew by 60% (table 1). This equals an average annual growth rate of 4,8%. This rate itself is increasing, for the first period (May 87 to December 93) the monthly growth rate is 0,344%, for the second period (December 93 to September 97) the monthly growth rate is 0,448% (table 2). At rough calculation (Newell 1988) Nokopo population will thus double within 14,6 years, that is by 2012, 802 people will have to make a living on Nokopo territory, or when another calculation is applied, in 10,3 years, that is in early 2008, the ancestral grounds will have to provide food and shelter for 643 people, where there lived just 250 people in 1987.

Changes in pig management and their consequential decrease in numbers, have accelerated this process. These changes have not only paved the way for an easier conversion of forested land to gardens, but have also, by making pork a scarce commodity, generated a higher demand for cash, and therefore created the necessity of conversion of even more forested land.

1987

In 1987, money was scarce, a return only from small scale coffee culture, sale of garden surplus to teachers and other personnel from other parts of the provinces based in the area, while people felt unable to participate in a scheme set up by Lutheran Development Services and DPI (Department of Primary Industries) to grow European-type vegetables for the markets in town.

The people of Nokopo divide their territory into grassland- and forest. For these

two areas land management is different and a different set of rules are followed.

In the grassland, a sophisticated crop rotation is maintained, resulting in near-permanent cultivation. Occasionally pigs are introduced to the gardens, especially into mixed food gardens after harvesting, to dig up the leftover small tubers and to fertilise the plot with their faeces. However, for this purpose the garden has to be fenced, as pigs are not allowed to roam free in the grassland area but to be kept in enclosures.

Everywhere in the forest area the gardens are fenced in, as pigs are free to roam and would destroy any unprotected crop. Fencing is hard work: timber has to be cut and shaped into heavy posts for palisades. Deep ditches on the outside make for additional protection, and sometimes even double palisades are constructed. The activities of domestic pigs are definitely a major factor for forest reduction. In their search for food pigs dig up the forest floor and uproot small seedlings. There are large areas in the forest where the soil is completely turned over and people have to walk considerable distances into the forest to collect vines suitable for construction work.

Nokopo people keep considerable numbers of pigs: in May 1987, the 250 people of Nokopo owned 976 pigs, resulting in a pig to human ratio of 3,9/1. The pig/human ratio is a critical figure: The Nokopo 1987 ratio of 3,9/1 is extraordinarily high - as even in the Central Highlands of New Guinea, where ceremonial pig exchange is prominent, this ratio is seldom found, and only in the months preceding a major festival, higher than 2/1 or 3/1 (Waddell 1972: 61-62). At Nokopo ceremonial pig exchange is not prominent, hence there is no systemic population regulation, as postulated for other groups in Papua New Guinea (Rappaport 1968). For Tsembaga Maring people for instance, whose economy is comparable to Nokopo, a pig to human ratio of 0,8/1 to 0,3/1 is reported (Golson n.d. a: 63), or for Irakia Awa people, who, like the Nokopo, do not have cyclical pig exchange festivals this ratio was 0,55/1 and 0,7/1 for the years 1971 and 1972 respectively (Boyd 1984: 37-38).

In 1987 pigs at Nokopo were not only used for bride price (between 10 and 20 pigs were required for bride price) and other occasions (as child birth, baptism, confirmation, deaths, inauguration of new houses) but were also a source of cash income, the meat being sold to teachers and health personnel from other parts of the province. Pork was also domestically consumed and largely replaced the formerly more important game. Most Nokopo men hunted for pleasure and not for nutritional return.

> *In August 1988, seven individual hunters shared after a full night's stalking, one tree rat* (Uromys sp. *probably* caudimaculatus) *an animal of forest regrowth and garden land and with a body weight around 600-700g (Menzies and Dennis 1979).*

1993

Some time after 1990 the people of Nokopo followed the advice of visiting biologists and decided to enclose pigs not only in the grassland area but also in the forest, so that the disturbed forest had a chance to regrow and could be preserved for future generations.

In late 1993 the effect was already noticeable, the vegetation of the forest floor had regrown and Nokopo people were very pleased with it. Meanwhile the human population had grown and the pig population had decreased, 328 people now kept 724 pigs, with a much more 'normal' pig to human ratio of 2,2/1.

There were several reason for the decline of pig numbers:

- As the animals were kept in the same enclosures for considerable time, parasites could build up numbers, and diseases had spread, consequently there was a considerable loss of piglets.
- According to Nokopo people, keeping the pigs enclosed also prevented them from searching for grubs and worms in the soil, which are considered a major protein component of pigs' fodder, thus resulting in malnutrition.
- It was much more time consuming than before to keep pigs. Enclosed pigs cannot search for their own food but have to be regularly fed with garden produce and kitchen scraps. Not only had time to be spent to feed the pigs but more crops for their fodder had to be produced, that is more gardens had to be maintained.
- Once pigs were enclosed in the forest, the same rules as in the grassland applied. It was now the responsibility of their owner to maintain a strong enclosure, so that they could not escape and damage gardens. Thus, the hard and time-consuming work of building and maintaining palisades and ditches was now also in the forest area the responsibility of those people wanting to keep pigs and not of those wanting to maintain gardens.

1997

By 1997 the human population of Nokopo had further increased and the pig population further decreased; 401 people now kept 429 pigs, with a pig to human ratio of almost 1/1, a ratio which is considered 'normal' for rural people living under similar economic conditions in Papua New Guinea (see above). However, Nokopo people do not consider the situation to be normal. In their view pigs are too scarce, and young men are now having difficulties to obtain enough pigs for bride price. Pork has become a rare delicacy, while game is even less significant a source of protein than ten years before. Imported tinned fish and meat have largely replaced locally produced pork.

WHAT HAD HAPPENED AND WHICH FACTORS HAD BEEN OVERLOOKED ?

- As now the bulk of work to keep pigs out of the gardens lies with the pig owners and not with the garden owners, it is much easier and involves less labour to establish gardens in the forest. Thus, people were encouraged to establish more gardens in the forest zone than previously.
- The forest is seen to have advantages over the grassland when establishing new gardens: dry spells, which normally occur in June and July, are not as heavily felt in the forest as in the largely tree-less grassland. Good arable land is plentiful, in contrast to the crowded grassland zone, where gardens often have to be squeezed between others after negotiations with all concerned lineage members.
- More gardens are now needed, not only to directly feed the increasing population and the now enclosed pigs, but also for cash crops. More cash is now required, as pork is scarcer than before and its replacement, tinned fish and meat, has to be bought in the stores of the station two hours walk away.
- Previously, Nokopo people had not participated in the vegetable scheme set up by Lutheran Development Services and the Department of Primary Industries. Meanwhile Japanese volunteers had introduced a range of - mainly mediterreanean - crops which thrive particularly well at Nokopo and are in high demand for export to the coastal towns. The former major cash crop, coffee, is still produced, but only with this recent range of vegetables major parts of the arable land are now devoted to cash-cropping.

Children (cliché : C.K. Schmid)

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APPENDIX 1: TABLES

Table 1 : Nokopo census data 1987 and 1997

Year	*People*	*Pigs*	*Pig/Human ratio*
1987	250	976	3,9/1
1997	401	429	1,07/1
Balance	+151	-547	
Balance in %	+60%	-56%	

Table 2 : Nokopo census data 1987, 1993 and 1997

Date	*People*	*Pigs*	*Pig/Human ratio*
May 87	250	976	3,9/1
Dec. 93	328	724	2,2./1
Balance	+78	-252	
Monthly growth rate	0,344%		
Sept. 97	401	429	1,07/1
Balance	+73	-295	
Monthly growth rate	0,448%		

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SITE OF COMPLEMENTARY LONG-TERM RESEARCH

TRANGAP / OKSAPMIN

SITE DE RECHERCHE COMPLÉMENTAIRE DE LONGUE DURÉE

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RECOMMEND ATIONS

Any interventions which seek to have a real effect on the environment, such as conservation of natural resources, or the growth and preservation of the traditional knowledge concerning sustainable forest use, should first make an impact at a cultural level. One must determine the representations and ideas that people have about their environment in order to influence their practices for the better.

Furthermore, no initiative can succeed if it does not involve and empower local people directly, especially with the help of financial contributions.

Finally, in order to maintain these programmes, periodic follow up checks by outside experts are advisable. These may help prevent local power dynamics neutralising or even destroying the effects of conservation policy on traditional, sustainable land use practices.

SUMMARY

The Oksapmin people of Trangap are faced with three categories of risk: cultural, economic, ecological.

CULTURAL RISKS

The first domain at risk is traditional culture, which may be completely lost within a few generations. This process has been going on for some decades and will be complete within one decade. For more than 25 years the transmission of traditional knowledge has ceased. The missionaries have explicitly prevented initiations, the primary context for this cultural transmission. All other forms of traditional ritual are censured by the missionaries, in particular the local pastors who are well aware of traditional practices and the context in which they are found. They are therefore able to detect them and publicly condemn them (garden magic, hunting magic, witchcraft, etc.).

ECONOMIC RISKS

The second domain at risk is economic, linked to the process of globalisation. The society is moving from a subsistence to a market economy where salaried labour is creating a dependence on the external world. Development and economic well being is increasingly tied to the presence of mining companies, which leads one to wonder what will happen to this new local (rural?) middle class' 15 to 20 years from now, when the natural resources will have been exhausted. Plans for agricultural projects to reintroduce arboriculture and sustainable resource use must begin now in order to address this problem.

More generally, there is a problem with the gatekeepers of economic development. These people are almost exclusively missionaries and personnel from foreign mining companies. These external agents are not interested in preserving the ecosystem and, moreover, often transmit a distorted view of development. Anthropologists are foreigners as well, however they should be professionally and ethically better-equipped to defend their host people's rights. Anthropologists should, when possible, act as interpreters and mediators between local populations and external agents.

ECOLOGICAL RISKS

Finally, the third area of risk, ecological, has to do with the effects of technological, cultural and economic changes on the environment. The reduction of the forest area has restricted peoples' access to traditional resources and created a growing dependence on imported food and thus monetarisation. Loss of traditional knowledge has restricted extraction, by local people, of their own natural resources.

One of the greatest ecological problems is that neither the authorities nor the local people, especially the young people, seem conscious of the impact of these environmental modifications. In cases of environmental damage (for example the pollution of the rivers) their reaction is limited, at the best of times, to demands for monetary compensation with no demands for long term environmental reparations.

1. THE OKSAPMIN OF TRANGAP

Oksapmin is a subdistrict of Telefolmin District in the West Sepik (Sandaun) Province of Papua New Guinea. The linguistic and cultural borders of the area called Oksapmin extend east and south to the Strickland river, north to the Om river and west to the Telefolmin District.

In the literature, the Oksapmin people are often grouped with the 'Mountain Ok'. The name *Oksapmin* is the term used by neighbouring *Telefolmin* people to refer to this group. In the literature and for administrative purposes the term *Oksapmin* is used to identify a linguistically and culturally homogeneous ethnic group within these borders. The research site was Trangap valley, which is one of the five valleys within the Oksapmin territory. The Trangap valley formed by the Tekin river in limestone mountains extends from 1550 and 2200 metres ASL. There were 959 inhabitants in 1995 (National Census 1995) while the total population of the Oksapmin area was 10.137. The surface area of the valley is approximately 60 km^2; that of the entire Oksapmin territory approximately 1.000 km^2. Population density is around 15,9 inhabitants/km^2.

Residential units in Oksapmin are a collection of nuclear families belonging to a single lineage or several related lineages. Men and women live in separate houses. Heads of families live with their fathers, their sons and the frequent male visitors in the men's house. Co-wives of family heads live with their daughters, other female relatives and visitors in another house. The household generally consists of the head of the family, his wife, children, their families (normally the sons but sometimes the daughters as well), and occasional visitors. The average size of a hamlet varies between 10 and 20 individuals.

The Oksapmin matrimonial household is polygamous, though there are no matrimonial households with more than two wives. The bride price traditionally consists of portable goods but in recent decades has also included money. Part of this is paid when the bride moves in with her husband and the rest later, particularly at the birth of the first child.

Political power, that is decision-making, economic and ritual authority, is held by the *kak-khan* (lit. 'chief man'), a leader and a prestigious person who owes his reputation, these days, to his knowledge of customs and his abilities as a diplomat in conflict resolution. Prior to the ‘pax australiana’the *kak-khan's* prestige depended on his prowess as a warrior as well.

Decisions which concern only a single lineage (for example settling the amount of the bride price) were traditionally made by the *kak-khan*. Where several groups or lineages are involved, for example when determining the limits of access rights over a commonly held territory, decisions are made by a group of *kak-khan*. Women have no decision making power, at best exerting individual influence over their husbands, but

generally not their brothers or fathers. Today there are several new actors in the decision making processes, in particular the provincial and central government, and foreign companies. These groups are counterbalanced by 'brokers' who serve the double function of mediation and defence of local communities against exploitation from external agents. These brokers can be placed in three categories: migrant workers, students, and politicians. Nevertheless, all decisions regarding the exploitation and conservation of the forest, although influenced by these three groups, require the approval of the traditional leaders.

There are no community wide religious leaders but rather individual men of high status. These men possess traditional knowledge and authority and are also ritual experts. Each follows the specialisation of his clan (for example knowledge of pig, marsupials, taro, earthquake, wind etc). There are also male and female sorcerers.

There is no sacred/profane opposition in traditional representations of the invisible. All living creatures have a soul *(dä)*, not exclusively human beings. The after life is not conceived as retribution for existence in this life but rather as a neutral limbo, similar to the concept of hades in classical Greece.

Pre-contact religion was therefore essentially polytheistic overlaid by a pseudo-monotheistic cult, probably introduced from other Highland areas approximately 300 years before. This cult focusses on a female spirit who remodelled the culture, established new rules and assured the reproduction of natural resources. The name of this spirit is *Yuan-ku* in Oksapmin, however it is better known in the literature by the Telefol name, *Afek*. In order to ensure her reproduction, the cult was associated with the *yuan han* ritual which involved a human sacrifice. Since the 1960's the evangelisation process has ended the majority of traditional religious practices, notably the *Yuan han* ritual. Today there are two denominations present in Oksapmin, Baptist and Seventh Day Adventist.

The settlement area is made up of permanent hamlets of between two and ten houses. Within the hamlets all the residents either come from a single clan or from several related clans. The average distance between communities is approximately 1 kilometre. Men and women who belong to the same clan, or to related clans, build temporary houses either next to the gardens farthest from the village or in the forest when they leave to hunt for several days (usually for feral pig or cassowary). Other such temporary houses are built for food gathering activities, such as collecting megapode eggs, or harvesting pandan fruits. The mobility of hamlets within the limits of the territory follows a ten year cycle. The range of displacement varies between a few hundred metres to a few kilometres at most. This is primarily dependent on social constraints (relations between neighbours) and not necessarily on ecological ones (proximity of resources). In cases of major hostilities there are areas which can absorb refugees from related clans.

Since the *'pax australiana'*, beginning in the 1960's, relations between neighbouring groups have generally been peaceful. Witchcraft accusations and delayed

payment of bride price constitute the principle conflicts outside the family. Tension between co-wives represents the principle cause of conflict within the family and can lead to homicide. Murder is compensated through money payments, but if the amount of compensation cannot be agreed upon between the parties then people turn to the civil courts. The last case of murder attributed to jealousy between co-wives was in 1996.

Oksapmin practice swidden agriculture. The staple crops are sweet potato *(Ipomoea batatas)* and taro *(Colocasia* sp.*)*, but usually about ten different cultivated crops are planted in the gardens: bananas *(Musa* sp.*)*, Highlands 'pitpit' *(Setaria palmifolia)*, oil pandans *(Pandanus conoideus)*, sugar cane *(Saccharum officinarum)*, nut pandans *(Pandanus jiulianetti* and/or *P. brosimos)*, maize *(Zea mays)*, yam *(Dioscorea alata* and *D. esculenta)*, tapioca *(Manihot esculenta)*, and various vegetables. Land for gardens was traditionally cleared from secondary regrowth. However, in the last three decades clearing has increasingly taken place in mature forest. This is the result of the introduction of steel tools, of increasing demographic pressure, and Christianisation, which has led to the secularisation of the forest. The average size of an Oksapmin garden is approximately 4.000 m^2. The length of the fallow period used to be 15 to 20 years for sweet potato gardens and 20 to 30 for taro gardens. Fallow fields are now cleared after 5 to10 years for sweet potatoes and 10 to 15 years for taro.

The main crop is sweet potato, which is cultivated up to an altitude of 2500 m. In the gardens established on the flat valley bottom, sweet potatoes are cultivated on mounds in order to drain excess rainwater. In the gardens on the slopes, sweet potato is cultivated without mounding. Poor soil fertility means that there is only one harvest before a garden is left to fallow. Almost all gardens have fences to prevent access to pigs. However, high altitude gardens are not fenced because neither domestic nor feral pigs go there. Taro *(Colocasia* sp.*)* is the dominant crop in this type of garden. It is preferably planted at high altitudes because it is a traditional male food which is reserved for men whose sphere of subsistence activity is the high altitude forest.

The region produces vegetables for the Oksapmin Vegetable Market, one of the rare examples of an agricultural co-operative in Papua New Guinea. Vegetables are sold in the mining centre of Tabubil (Ok Tedi Mining Limited), a 40 minute flight from Oksapmin. Potatoes, cabbage, tomatoes, courgettes, broccoli, peppers, carrots, and onions are all sent there. This cash crop agriculture has lead to the monetarization of the valley. Salaried workers from the Ok Tedi mining company in Tabubil provide the other modern economic resource.

The process of monetarization and the establishment of a market economy began in the 1980's with vegetable marketing. People in Tabubil and in neighbouring regions, including the Oksapmin, were encouraged to begin vegetable cash cropping to satisfy the needs of the growing township which is mainly inhabited by the employees of the mining company.

Prior to the installation of the mine the only salaries came from government work: maintenance of the air field, of the government station, and of the road between Oksapmin and the neighbouring Tekin valley. Two weeks work for the government, Monday to Friday from 8:00 to 12:00 and 13:00 to 17:00 paid 50 Kina (Euro 20). By comparison, an employee at the mining company earns between 250 and 500 Kina (Euro 100 to 200) for two weeks work. This work involves men between the ages of 18 and 35. Officially, paid workers constitute 2% of the total population but in reality at least 10% have salaried work.

Above 2500 m altitude, cultivated areas are replaced by primary forest, where the men hunt with the help of dogs. Hunting is mostly done with bow and arrow as rifles are too expensive. Even in cases where people have learned to make their own rifles the price of ammunition remains prohibitive, being as much as 10 Kina (Euro 4), while one day of work pays between 2 and 5 Kina (Euro 0,8 –2). Hunting zones are the high mountain forests, the foothills forests, and the savanna areas along the river. Hunting areas are increasingly far from inhabited areas and the hunters leave in groups for trips which can last from one to several nights depending on the type of game. Men hunt large game: cassowary, feral pig, large marsupials, forest kangaroos, and certain types of birds. Women and children hunt and gather small game: small marsupials and rodents, frogs, larvae and insects. This division of game animals reflects the different food taboos for men and women.

Oksapmin animal husbandry focusses on pigs which are intended for domestic consumption, intertribal trade, bride price, compensation for witchcraft accusations as well as for murder. The pigs have been fed and kept in enclosures for the past few years following a national policy instigated by the civil servants of the department of agriculture and livestock.

Schooling is public and education is given in the maternal language (Oksapmin) for the first two years (grades 1 and 2) and then in English for the next 6 years (from grades 3 to 8).

2. FOREST USAGE

Both in the village and in the forest, different territories are claimed and acknowledged, depending on lineage and clan membership, and on the basis of clans sharing a common origin. The limits of these territories are often not clearly defined and there is a good deal of disagreement among the holders of customary knowledge. Borders are maintained by mutual respect. When a dispute arises the old leaders are called in. Disputes progressing to the formal civil courts in the capital have not yet been observed.

Rights to cleared land belong to the clan that created the first garden. An individual (or someone from the same lineage) who has set up a garden may demand the right to re-clear the area, even if the territory does not belong to his or her clan. In all cases it is up to the clan who 'owns' the land to make a decision.

Certain religious activities require use of the forest, notably rituals linked to hunting and to the cultivation of pandans. The *Yuan han* ritual sacrifice was closely tied to use of the forest. It was, in effect, a fertility cult, a ritual for the regeneration of the entire natural environment, both domestic (the world of gardens) as well as wild (the world of the forest). In the forest there were places associated with different ritual activities: the *Yuan* cult, the house of spirits *(ap yuol)*, ceremonial houses *(han ap tem)* and taboo locations where spirits lived.

Hunting in the forest remains extremely important. Small game is frequently hunted or gathered (marsupials, anteaters, rodents, bats, venomous and non venomous snakes, megapodes, lizards, monitors, large and small birds, insects, larvae, frogs), as is large game such as feral pigs and cassowary. Hunting is mostly done individually with bow and arrow, however wild pigs are collectively hunted. Traps and bait are placed in the forest or close to the gardens.

Collection of wild food products (plant and animal) is also important. Around fifty different plant species provide the raw material for locally produced items (gourds for water or lime containers, pipes, arrows, digging sticks for planting or harvesting tubers, plates).

Agricultural products form the basis of the diet. The contribution of wild food varies according to the season. During their fruiting season, the nuts of pandans *(Pandanus julianetti* and/or *P. brosimos)* are the most important semi-cultivated crop. Seeds and leaves of other wild species represent between 10% to 30% of the diet (depending on the season). Game animals, bird eggs, certain grubs and insects provide a significant contribution of animal protein to the diet of the groups which reside farthest from the air field and thus from the trade stores. Western food is bought in the small village stores. Tinned meat and fish, salty and sweet biscuits, and sugared drinks make up 10 to 20% of the diet, however this varies a great deal according to the distance of the village and economic power of the people.

Traditional specialist healers use many wild products, such as nettles *(Laportea decumana)*. The Oksapmin are reputed by their Duna neighbours to be formidable sorcerers.

The monetarization process, which began among the Oksapmin in the 1980's with the marketing of vegetables, has lead to the extension of areas of cultivation into the forest.

Wild food resources such as megapode eggs or opossum skins used to make traditional string bags are targeted at local markets.

3. FEATURES OF OKSAPMIN RELATIONS TO THE FOREST WITH IMPLICATIONS FOR FUTURE RESOURCE MANAGEMENT

1. Forest degradation is visible, especially in the secondary forest, including the area above 2000 metres in altitude, and the anthropogenic savanna areas at the bottom of the valley.

2. The most significant change from pre-contact times has not been the reduction of the fallow period, but rather the encroachment into forest areas which had previously never been cleared. This is due both to improvements in technology, allowing easy felling of mature forest trees, as well as changes in the religion which have ended traditional restrictions.

3. Oksapmin people, especially the young, do not seem to realise that arable land is limited and that the forest is not inexhaustible. The majority of informants, particularly men, when questioned, reply that they do indeed see that the forest is receding. However, they do not believe this is a real problem because new agricultural techniques and drainage systems will allow cultivation on land that, at present, is unfit for agriculture, such as swamps. Furthermore, people concentrate their hopes for the future on salaried employment with foreign companies rather than on either cash or subsistence agriculture. Women are generally far more concerned and realistic about the future of the natural resources.

4. Small scale logging for local markets began in 1995, following the purchase of a portable sawmill by a politician. The machine broke down in 1998 and the business has stopped for the moment.

5. Mine prospecting is underway and it would seem that an important natural gas site has been discovered in the village of Dubanap, near Strickland. However, this information has yet to be officially confirmed.

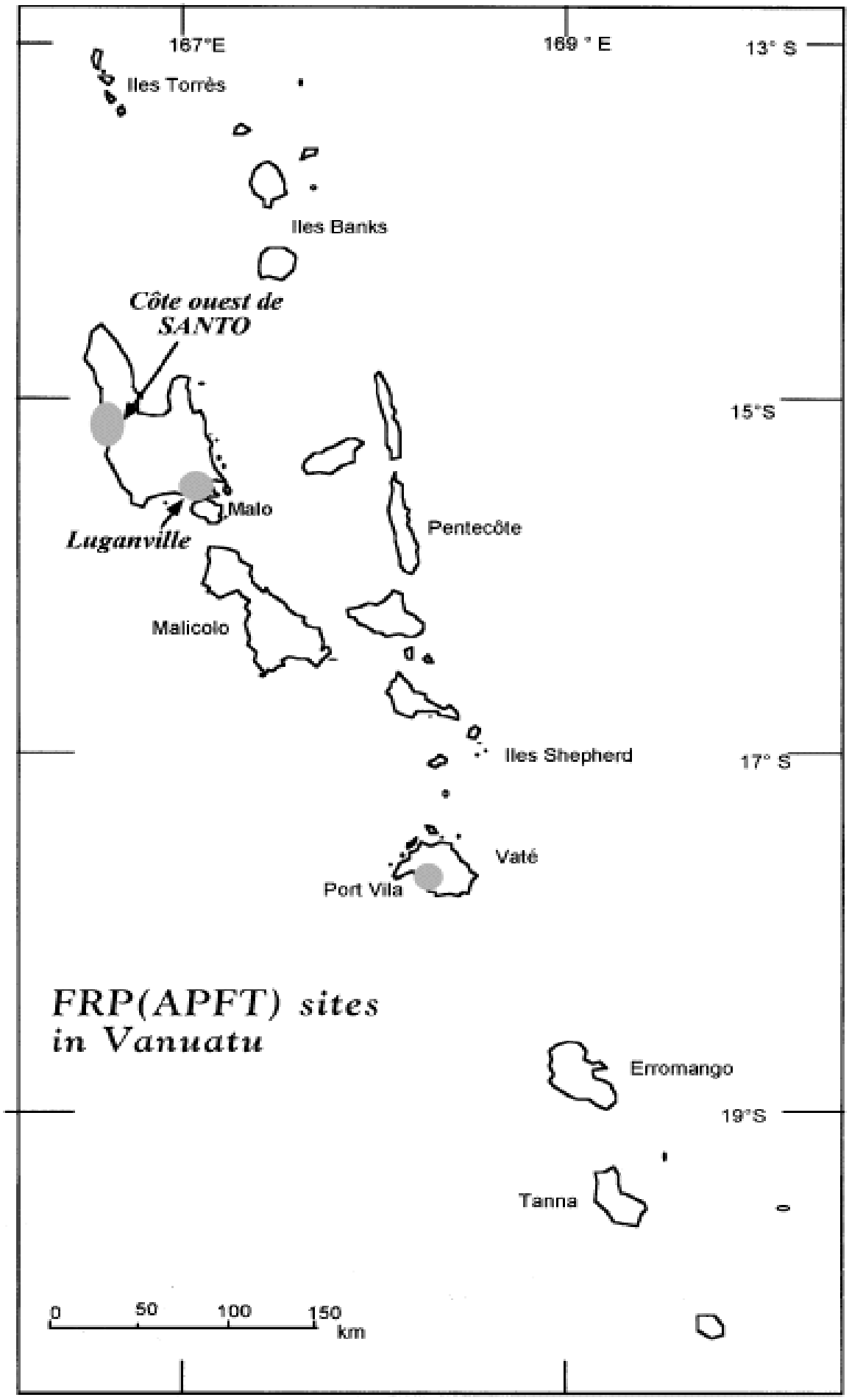
6. The transformation of the forest in Oksapmin began in the 1970's after the introduction of steel tools, the availability of firearms and, above all, the abolition of those cultural practices which created taboos on hunting and farming. Primary forest areas have been considerably reduced. The amount of game hunted has noticeably diminished due to physical changes in the hunting territories as well as the proximity of the air field.

7. Traditional practices and notions about the forest have been suppressed by religious conversion. The missionaries have imposed a cosmological vacuum which separates people from their environment.

8. The presence of mining companies and their means of exploiting and transforming the land has also helped modify people's representation of arable land. Prior to the presence of mining companies land was considered a potentially unlimited resource, which some people are now beginning to appreciate is limited in time and space.

9. Faced with these environmental and cultural changes the Oksapmin of the Trangap valley have not shown an interest in preserving their traditional cultural and ethnic identity. The eradication of traditional customs is seen as a sign of modernity by the younger generation.

III
VANUATU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SITES OF INTENSIVE INTERDISCIPLINARY RESEARCH (SSIR)

SANTO / VANUATU

SITES INTENSIFS PLURIDISCIPLINAIRES (SIP)

TRANSFORMATION OF SUBSISTENCE MEANS IN VANUATU

TRANSFORMATION OF SUBSISTENCE MEANS IN VANUATU

INTRODUCTION

Annie WALTER

Vanuatu is an archipelago in the south Pacific, located between the 14th and 16th parallels. It is composed of more than 80 islands scattered over 900 square kilometres, only some of which are inhabited. The 175.000 people (1989 census) are concentrated along the coasts, having abandoned the interior of the islands. Archaeological vestiges of earlier occupation are still visible.

The archipelago was first settled about 3.000 years ago by Asiatic or Melanesian seafarers whose exact origin is still unknown. Over time, other people from the north, or later on, from Polynesia, also migrated there. When Quiros discovered the archipelago in 1606 there were already a large number of communities. Although contact with Europeans was established at that time, colonisation would only really begin a century and a half later. It would be followed by heavy population losses, significant migration towards the coasts, the opening of trade routes, conversion to Christianity and the creation of schools. Vila, and then Luganville, would experience moderate urbanisation. After 1906 the country came under joint French and British control and was known as New Hebrides. When the country was granted independence in 1980 it remained rural (80% of the population) and traditional.

The power of tradition is as important as that of religion. Nationally, the constitution recognises the traditional powers and tribal chiefs continue to play a role in the country's affairs. Paradoxically, tradition is often less influential on the local level as the young people are drawn to the western lifestyle and value system.

The climate is tropical in the south becoming more equatorial towards the north where rain is more abundant and where the average annual temperature is higher. This leads to differences in vegetation between the islands to the south of Vate and those situated to the north. Endemic species are rare and the flora, relatively poor (less than 1,500 species), exhibit affinities with the Solomon Islands to the north and with Fiji to the south. Here, the floral richness seen in New Guinea has been selectively thinned, favouring useful species. Due to significant human impact, the natural shade-loving forest has been replaced by secondary growth between sea level and 500 metres in altitude.

The islands of Vanuatu are marked both by isolation and by connection to one another. Historically, communities formed extensive trade networks often linking far distant islands, which allowed the easy circulation of objects, plants and ideas. Today, the

country's 101 languages form chains of inter-intelligibility facilitating communication between different groups although locally there may only be, on average, 300 speakers. The peoples of Vanuatu are of diverse origins and have experienced repeated mixing of populations. They form small, fiercely independent communities, characterised by scattered habitations. (Villages with more than 200 inhabitants are rare.) These are compressed into small geographic areas consisting of a few hamlets. In a constant search for identity, villages paradoxically seek connections with the outside world. They are open to new, foreign and, for them, exotic ideas, plants, objects, rituals and dances. Thus, everything new is easily adopted but reinterpreted and assimilated after having been duly tested.

The name and the soil of Santo, Vanuatu's largest island, can be considered as representing all of the country's history. A land of contrasts and a land of trade, it has seen everything -- raids of sandalwood traders and blackbirders, recent logging of large areas of its kauri forest, violent conversion to Christianity, and the emergence of the naked cult. Following dramatic depopulation, there was a period of unprecedented migration as well as the mixing of populations. This social recomposition, in certain places led to the disappearance of some groups as well as linguistic fusions and, more recently, to a violent attempt to secede just as independence was granted.

The oldest known archaeological site, dating from 2.900 - 2.550 BP, is on Malo, an islet situated off the coast of Santo. Rich in lapita pottery, it is to date, the earliest evidence of the original inhabitation of the archipelago.

Big Bay, on the northern shore of Santo is where Quiros first set foot on the land that he was to christen Espiritu Santo (Holy Spirit), mistaking the large island for a continent. This island was only truly colonised after 1853, when sandalwood was discovered in its forests. Conversion to Christianity, long deferred because of malaria-infested coasts and the difficulty of penetrating into the interior, began in 1869. The first Presbyterian training centres for native catechists were built on Malo and Tangoa. Evangelising progressed by fits and starts, finally taking hold by means of recruiting local people, hastily trained but with financial and moral backing.

Mountain peoples began migrating toward the modern world to which they had been recently introduced. Populations moved toward the coast, where there were coconut plantations, missions and access to the first merchant boats. The new concentrations of people fuelled epidemics: malaria in the infested areas and foreign diseases against which the previously unexposed populations had no defence. This created conflict between the coastal and mountain peoples. Their contact, which in the past had been strictly regulated, evolved into violence and disdain. Above all, it resulted in significant depopulation and the disorderly return by communities inland. Their return spread the pathogenic germs and accentuated the population losses in the country's interior. The ravaged and disorganised survivors regrouped as best they could. Choices about where to go were

guided by a number of factors. The first choice was whether to accept or refuse the modern world. Thus some people descended towards the coast while others fled further inland, totally rejecting the white man's world, goods and religion. The second choice was based on religious conviction. In general, those newly Christianised remained close to the coast whereas those who sought to preserve their traditional beliefs settled in the interior valleys. Finally, choices also were influenced by kinship ties and often, but not always, by language. Thus, since the 1950's, a new social order has evolved and today communities are more or less settled in loosely defined territories. Nonetheless, underlying divisions remain clearly present, vestiges of the many social recompositions. Despite the communities' efforts to smooth them over, differences can suddenly erupt, splitting village units, modifying religious affiliations, and renewing migration. As F. Tzerikiantz will describe in Chapter 1, the settlement of the groups on the western coast is recent. While apparently stable, it is in reality fragile and diverse pressures may again cause fragmentation .

Santo is also one of the few islands of Vanuatu whose mountainous interior is inhabited. The two highest peaks of the country (Tabwamasana and Santo) are located there flanked by kauri forests, highly coveted but protected by traditional law. The inland communities, voluntarily cut off from the world (and increasingly from anthropologists) border westernised areas (eastern coast) as well as very isolated areas (western coast).

The agricultural systems of Santo are also extremely varied -- vast hydraulic systems for irrigating taro plantations, slash and burn techniques for cultivating yams, and on coral islets, seasonal cultivation of breadfruit. In the past, there were communities whose subsistence system was based on the cultivation of sweet potatoes (Cape Quiros peoples).

Access to the modern world is growing year by year. Luganville is becoming more urbanised and previously isolated regions are being opened up through the construction of new roads or the organisation of motorboat transport networks.

As D. Greindl will show in Chapter 2, the development of Luganville has been modest. This noted, Luganville is certainly more than an urban concentration. Covering a large coastal area, it has become a magnet for inland inhabitants. To live on an island, while remaining linked to the rest of the world, there must be access to transportation networks and other modern infrastructures: hospital, schools, harbour, state and financial institutions, shops and an (international) airport. These structures form the heart of the urban centre, from which connecting roads have contributed to development along the southern coast as far as Tassiriki and up the eastern coast to Big Bay.

Tassiriki, once a centre of early missionary activity, is now the outermost point on the road to Luganville and the modern world. Travellers from communities on the western coast reach Tassiriki only by motorboat, which is difficult in bad weather, slow (four hours) and expensive (400 FF). Inland people must travel, often on foot, until they

intersect the road into Luganville.

Taking advantage of their easy access to Luganville by road, Tassiriki and the other villages on the southern coast have started market gardens and sell surplus produce there.

Big Bay, where Quiros first landed on Vanuatu more than 300 years ago, was recently connected to Luganville by road, by way of an existing transport route from Luganville to Olry. The older road permitted the development of a large area to the east. The new road will open another region that has been very isolated until now. Inland dwellers are moving closer to this road, a symbol of the riches they seek, as F. Stroebel shows in his elegant study of Wusiroro.

Cumberland Cape and its villages were opened in the early 1990's with the completion of an airport. The prohibitive cost of air freight inhibits any substantial trade between this region and Luganville.

In summary, Santo is an island with three distinct regions. The eastern zone and touristic islets -- long ago converted to Christianity and western culture -- interact continually with Luganville and provide it with fresh foodstuffs. The more isolated and drier west, is also Christian but remains culturally more traditional. Its inhabitants, small groups recomposed after colonisation, are subject to outbreaks of malaria. Finally, there is the interior which remains wild and inaccessible. It is covered by a forest that is stewarded by local peoples. Both useful and commercial species (sandalwood and kauri) flourish there and are the source of much envy. Along the more populated coasts, especially to the west, the soil is poor and badly eroded. Careful management of the environment and its rich biodiversity is essential for the development of the island.

The next three chapters will treat respectively the communities of the western coast, the development of Luganville, and two rural communities on Malo and their relationships with Luganville.

Fabienne Tzerikiantz will demonstrate how the communities in the west, formed from the post-colonial migrations and mixing of peoples, have enhanced their present environment, combining their traditional knowledge of mountain farming with the constraints presented by the environment. She then will show the risks looming over the futures of these communities and the solutions they have begun to implement.

In the second chapter, Delphine Greindl will treat the development of Luganville, an artificial town reclaimed by communities from the north of the archipelago. Using observations of a specific neighbourhood, she will demonstrate how the town is 'feeds itself' through subsistence gardening and trade. She will also examine the relationships between the town and the forest. It will be seen that the development of the town governs the evolution of the coastal zone and may indirectly lead to the transformation of the interior.

Finally, Matthew Allen will describe the current state of development of two communities on Malo, based on the islet's trading relationship with Luganville. He will

recount the communities' transition to market gardening, and their increased use of commercial products bought with the proceeds from selling their fresh produce in Luganville. As a result, their daily diet is increasingly diverse and no longer subject to environmental conditions.

RESULTS AND RECOMMEND ATIONS

1. Santo's communities are well established in their limited territory. They have never lived in isolation and have always incorporated new plants, techniques and ideas into their subsistence system.

2. Throughout time, communities have introduced and adapted plants to the islands' environment. They have also transformed the environment to accommodate their staple and imported crops. Santo's territories are thus closely managed, and the residential and forest zones are both rich in useful species.

3. Previously, the patterns of settlement and habitation followed two models. In the first model, as on the coral island of Malo, a group occupied a territory that extended from the coast to the mountainous interior. They cultivated and exploited the diverse biotopes. In the second model, as on the west coast of Santo, some groups occupied the coasts, others the mountainous interior. Exchange between groups allowed everyone access to the available resources from the different environments.

4. Westernisation has deeply modified, as least on Santo, settlement patterns and social organisation. In particular on the western coast, all of the communities are composite groups arising from the populations mixing at the time of European colonisation. When the coastal groups disappeared, the inhabitants of the interior expanded into the territories on the edge of the sea by following the rivers downstream. These migrants continued to maintain contact with the sites of their former homes. It is possible that this movement will be reversed in the future, with communities returning upstream towards the interior. This will depend on which new economic possibilities develop and on the resources of the present territory.

5. Westernisation has also disturbed the previous maritime trade network and has left isolated those communities that lack access to new transport infrastructures: roads, harbours or airports. Today, it is these lines of communication that influence the population movements on the island and the type of agrarian system that is used. In moving closer to the roads, the communities must adapt to new environmental conditions, sometimes favouring the cultivation of a plant that is sure to sell well.

6. The subsistence systems themselves have been profoundly transformed over the centuries. On Malo, where yams were the staple crop, the agricultural system was initially intensified through the cultivation and diversification of breadfruit. Later, vast, commercially-oriented coconut plantations were started. In western Santo, where taro was the staple crop, intensification occurred through the planting of coconut palms on the walls of the irrigated taro plantations. At the same time, yams were exploited in small slash and burn gardens. Today, the cultivation of yams is increasing as a first step in the preparation of vast cleared zones on which coconut plantations will be grown. The coastal forest is thus threatened with extinction to benefit plantations whose income remains unproved.

7. A common effort of all groups has been to improve the security of the food supply in their own territories. To free themselves from dependency on seasonal staple crops and climactic uncertainties, they have adopted two approaches -- to maintain and increase diversity, especially within species, and to trade foodstuffs with other communities. As examples, the communities on the western coast of Santo introduced year-round crops, such as Fiji taro (macabo) and manioc. The peoples of Malo opted for seasonal succession, planting yams followed by breadfruit. Communities close to the market and shops of Luganville have recently converted to market gardening. The income allows them to buy products such as rice and tinned goods. Two issues emerge from this strategy -- the preservation of forest that otherwise would be clear-cut for yams, and restoring fallow periods to allow enough time for regeneration.

8. Among the more isolated communities of the western coast, where the land’s resources are poor, a growing population faces an uncertain food supply. Particularly at Wusi the soil is becoming impoverished, and the site will not feed its population for much longer. Inhabitants have sought other remedies for the insecurity. Residential groups have begun to fragment. Some family units are migrating north toward the road leading to Luganville and its potential markets. Others are returning upriver to start irrigating new taro plantations. Groups remaining on the coast are attempting to increase yields of coconut palms by opening new plantations.

9. Whatever the solution, the communities living traditionally in the forest have respected it and increased the number of useful species. Even slash-and-burn agriculture was never allowed to lead to deforestation. When yams were cultivated, fallow times of thirty years or more ensured regrowth. At taro plantations, the hydraulic system was maintained for twenty to twenty-five years. Fields then were left to rest for a period that was at least equivalent to the forest fallow time, again allowing ample regeneration.

10. One risk to the future of the forested mountain regions would be depopulation followed by acquisition of these lands by groups that are less scrupulous than the current inhabitant-farmers. In the absence of people committed to defending their resources, exploitative mining and lumbering projects would be far more likely to prevail, with the all-too-familiar environmental consequences. In this regard, the fragmenting of human communities (as noted in Vanuatu) is an indirect method of protecting the environment. None of these widely spread groups wishes to degrade the territory on which it depends for survival. The forest and its biodiversity will never be better protected than by the people who live there and draw on its resources.

11. In order to maintain populations on their home territories, income and living standards must improve. The peoples of Santo's western coast feel isolated and poor. It is difficult for them to provide for the health and education of their children. Perhaps the very act of opening up the region – the creation of clinics, schools and waterways to carry food to Luganville – will ensure the protection of the forest.

1 For more information about the settlement and Christianisation of Santo's west coast see: Galipaud and Walter: "De la forêt vers le rivage" in Galipaud and Walter (eds), 1997 - Forêts insulaires, rapport intermédiaire du programme Se nourrir à Santo, ORSTOM/APFT, pp.11-42.

CHAPTER 1

THE WESTERN COAST OF SANTO: TRANSFORMING THE MEANS OF SUBSISTENCE

Fabienne TZERIKIANTZ

Figure 1a

Santo Island, northern part of theVanuatu archipelago: settlement areas and transport infrastructures

Santo's western coast was formed by a volcanic outpouring. The mountain slopes are cut by deep and precipitous river valleys. They are subject to landslides which are the result of earthquakes, abundant rains alternating with long dry periods, as well as human exploitation of the areas resources. The pronounced erosion of the hills both at the edge of the sea and in the high valleys, gives the coastal fringe an abrupt aspect. The rare plains are long and narrow, and the access ways to the gardens are often only a series of friable, steep paths.

The vegetation is characterised by semi-deciduous forests associated with "pyrogenic" savannahs (Quantin, 1976). These are typical of hot tropical climates with two contrasting seasons[1]. Above 800 metres, a mountainous forest offers a cooler, more humid climate.

Today, people have settled at the mouths of the rivers. Here, numerous upheavals have created rich coastal terraces 5 to 25 metres above sea level. It is on these coastal terraces that the villages of this study are located: Tasmate, Elia, Kerepua, Wusi and Linturi.

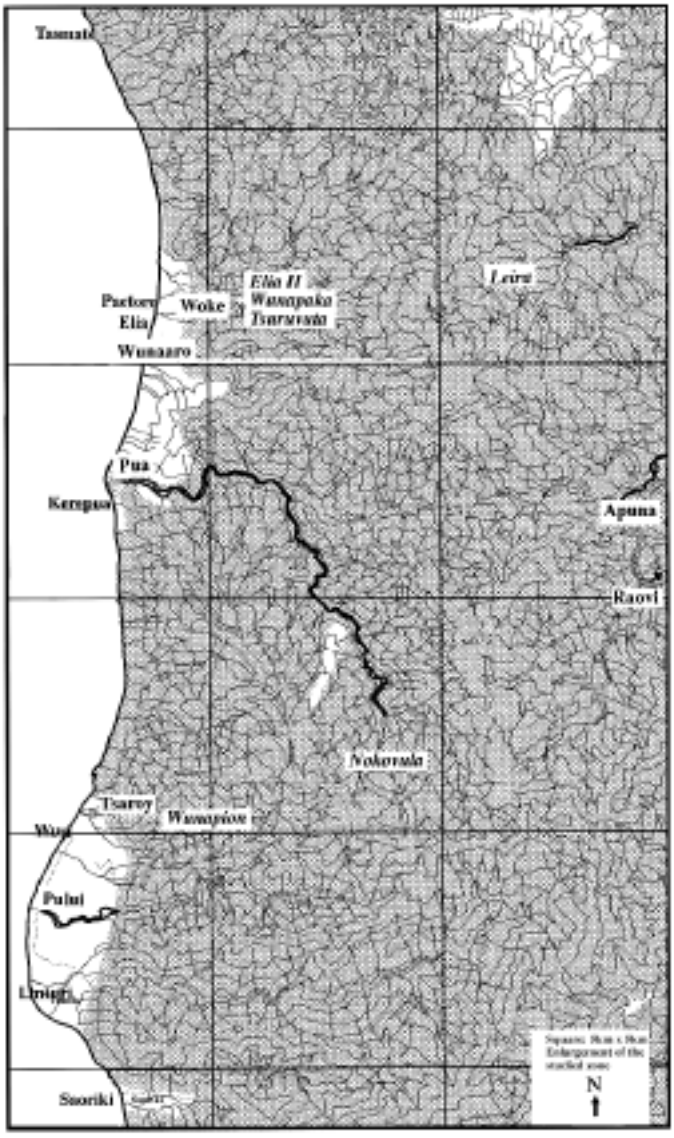

Figure 1b Studied area (detailed)

1. THE PEOPLES OF SANT O

Before European colonisation, the western coast of Santo was settled as far north as Tasmate and as far south as Wusi. Elsewhere there was no human habitation but there were landing points for dugout canoes which were used in the trading of goods between groups[2]. Sometimes, for example at Elia, land was occupied by the yam gardens of the neighbouring inland populations.

Evangalisation of the island began at Nokuku in 1869, reaching Tasmate a few years later and then the back country of Elia in 1918. This led to significant concentrations of people on the coasts, which were swept by epidemics of foreign diseases as well as a resurgence of malaria. Survivors fleeing towards the interior propagated the germs. This resulted in depopulation. The survivors of distinct communities were brought into contact and the social structure was significantly disturbed. These multiple changes transformed the inhabitants, their rhythm and way of life.

The people from along the banks of the Apuna and Raovi Rivers settled in Elia whereas those from the mountainous interior near Mount Tabwemasana settled in Wusi and Kerepua. Once on the coast, these inland people confronted living together with villagers whose culture and dialect were different. They were also faced with a new climate and physical environment. They initially tried to reproduce their previous way of life. However, given the change in milieu and the new demographic pressures, they soon had to modify their agrarian practices, as well as some of their dietary habits and eventually their vision of the world. Each group used its own ingenuity in transforming the physical and intellectual relationships they had with their natural environment, wild and cultivated.

1.1 DEMOGRAPHY

Today, the population of Elia numbers 24 households and 115 inhabitants. Wusi has 22 households and 95 people with a population density that is never more than 1,5 inhabitants/km^2. The table below (Figure 2) records the movement of Elia's population from one residential site to another located on the coast between 1979 and 1998. In contrast, Wusi's population, whose residential site was already determined, has increased steadily since 1979.

Villages	*Hamlets*	*Num. of Households*				*Num. of Inhabitants*			
		1979	*1989*	*1996*	*1998*	*1979*	*1989*	*1996*	*1998*
Elia II	*Elia II*	5	6	0	0	21	30	0	0
	Tsuruvuta	1	?	0	0	6	?	0	0
Elia I	*Elia I*	9	11	20	24	24	61	104	115
	Petlima	1	?	0	0	3	?	0	0
Wusi	*Wusi*	14	14	19	22	50	53	86	95

Figure 2: Principal demographic changes in Elia andWusi from 1979 to 1998

The communities are now relatively settled in stable locations along this coastal fringe. The coast presents certain environmental constraints to which the communities have been able to adapt. The relatively sedentary nature of these two communities is reinforced by the presence of modern infrastructures. At first a church is built, then invariably a shop, rarely well stocked but where preserved meat and fish, rice, sugar, salt, soap and clothes... can be bought. A "Kinda", a sort of day nursery for 2-5 years old, might be built and sometimes an "Aidpost", as in Kerepua and Wusi, or even a dispensary, as in Tasmate and Tasiriki where two nurses form the south of the island are employed. There is always a guest house ("Haos blong Woman", the Women's House) for voyagers, clergy or visiting relatives. These institutions were not always available when the inhabitants lived in scattered abodes along the Apuna and Raovi Rivers. Their presence concentrates inhabitants in a single area and confirms the usefulness of the village through services they propose.

Three primary schools along the coast draw children (6-12 years old) from all over the western part of Santo. At age 12, all return to their native villages. Secondary school education is only available in the southern part of the island or in Luganville and this is generally beyond their parents limited means.

Although it appears that the communities are becoming more settled it is frequently only relative. Many different factors indicate that it is unlikely that these populations will return to their places of origin or will disperse along the coast or inland. However, population is being redistributed through the appropriation of abandoned lands and the displacement of cultivated plots towards the road to the north, a re-organisation of the habitat close to the irrigated plantations, and a partial population explosion along the coasts (Figure 3).

Village	*Locality (Hamlet)*	*Households*			*Male Pop.*			*Female Pop.*			*Total Pop.*		
Year		*96*	*97*	*98*	*96*	*97*	*98*	*96*	*97*	*98*	*96*	*97*	*98*
Elia	*Elia*	10	11	12	26	27	28	23	25	27	49	52	55
	Valpei	1	1	1	5	5	5	4	4	4	9	9	9
	Sewu	1	1	2	7	7	7	3	3	4	10	10	11
	Raolewu	2	3	3	5	5	5	6	8	8	11	13	13
	Wure	1	1	1	1	1	1	1	1	1	2	2	2
	Slakipey	1	1	1[3]	2	2	2	4	5	5	6	7	7
	Wunapo'o	2	2	2	3	3	3	3	3	4	6	6	7
	Kwona	2	2	1	5	5	2	6	6	3	11	11	5
	Wunaruu	0	0	1	0	0	3	0	0	3	0	0	6[4]
	Total	20	22	24	54	55	56	50	55	59	104	110	115
Wusi	*Wusi*	19	20	22	47	47[5]	50	39	42	45	86	89	95

Figure 3: Table showing the demographic changes by hamlet1996 to 1998

There are many apparently disparate forces that will influence future population movements. The desire to be closer to Luganville and the southern part of the island will act as a magnet for some (Wusi and Linturi), whereas others (Elia and Tasmate) will be drawn towards the road to the north. Some will migrate because of the need to be closer to inland mountain gardens or, conversely, the need to maintain a copra plantation on the coast. Finally, the coastal dwellers, although mostly Presbyterian, may be attracted by other religions, such as the Seventh Day Adventists at Big Bay, towards which they may migrate.

1.2 LANGUAGES

With 180.000 inhabitants and about 113 languages belonging to the Austronesian group scattered across its archipelago, Vanuatu has the greatest linguistic density in the world. This is typical of Melanesia and has significant consequences in terms of identity. This diversity and linguistic density is the result of the encounter over time of a number of linguistic groups which have influenced one another (Tryon, 1978). The island of Santo is a good example of this phenomenon.

On Santo's western coast, Tasmate and Wusi belong to two distinct but inter-intelligible linguistic groups. The movement of women between these two groups, where wives go to live in the husband's village, gives rise to the circulation of the languages. Thus, a very great cultural and linguistic diversity can be found within the same residential group whose members are all more or less polyglot[6].

The languages circulate and with them, the inhabitants representations of their world, as well as concepts linked to certain illnesses, to body techniques, material life and social organisation. Thus the relationship between language and culture remains a complex affair here.

On Santo, according to the work of Tryon in 1976, 24 different languages were recorded, 6 of which were present on the western coast. A study in 1998 by Tryon and Walter indicates a certain amount of mobility in these languages and a slight decrease in their number. One of the reasons for this mobility is linked to inter-cultural/language marriages. When the father and mother speak different languages their children, although they have adopted the dominant language of the village, borrow words and even expressions from their mother's tongue. Thus, little by little the languages are modified. Additionally, the ever increasing use of Bichelamar (Vanuatu's common language of communication) has impoverished the vocabulary of local languages.

1.3 SOCIAL ORGANISATION

The villages of western Santo possess social structures similar to those of the northern islands of the Vanuatu archipelago (Vienne, 1984).

The society is divided into two un-named exogamous halves. Each half comprises a dozen named groups and each is linked to an origin myth.

These groups are called Wun in Elia, Kerepua and Wusi, Ta in Tasmate. Their origin myths refer to elements of nature: wild taro, yam, black ants, the king fisher, etc.

Within the same village not all groups are represented at a given moment. In spite of the repeated upheavals due to multiple migrations, the kinship system has sufficiently retained its traditional form that it remains similar from group to group. This has allowed the groups to continue to form matrimonial alliances.

This type of marriage uses a system of relationships that are positive rather than negative. Certain marital partners are defined as preferred but are not obligatory, the ideal union being the marriage of cross cousins. These unions are called 'privileged' as they imply other alliances. Although unions between cross cousins are encouraged, marriages between parallel cousins are prohibited. The ideal form of marriage is the exchange of sisters. The sons and daughters of one family marry the sons and daughters of another. Thus the two families are doubly linked, one to the other, and increase their rights to other lands. However, demographic effects sometimes prohibit a balanced exchange. Thus in the past, there were cases of polygamy (now forbidden by the church), or the differed rather than direct exchange of sisters (the child of a couple was given to the family that had not yet received a woman). Ritual murder was also performed (Tasmate) to insure the continuance of an essential equilibrium based on reciprocity.

Today, the young people respect these traditional rules of matrimonial exchange less and less. Although the exchange of sisters is still practised, a payment of money, pigs or cattle is also involved. Nor do the young people respect the law of exogamy, marrying within the same half, even within the same clan. Although these marriages are tolerated by the community and have little negative impact on the life of the couple, they are nevertheless forbidden by custom and are noted as such[7].

The law of residency is patrilocal, the wife living in the husband's village. The matrilineage has no property of its own. In matters of land holdings, however, it does retain certain rights through the intermediary of the maternal uncle. In brief, it is possible to cultivate the lands of different groups within the same half. In addition to the vast network of co-operative aide between village farmers of the western part of Santo, a wife, although living with her husband, must still maintain, cultivate and harvest the irrigated gardens of her native village (helped by her husband and children).

2. SUBSISTENCE SYSTEMS

From the coastal villages to the sparsely inhabited forest areas, the landscape contains many different types of vegetation. The inhabitants of Elia have always tried to control all of the various ecosystems from the interior valleys to the coast in order to have access to a variety of resources. While still living inland, they cultivated the fertile valleys of the Apuna and Raovi Rivers (200 to 600 metres in altitude) or the hills now situated in their immediate back country (200 to 400 metres in altitude). Their area of influence

extended on both sides of the large rivers and from the mountains to the sparsely inhabited ocean shores. Now settled on the coast, the inhabitants of Wusi and Elia continue to maintain immense forest areas on their native lands, investing work and using the available resources. The cultivation of these 'far lands' - 2 to 6 hours away by foot - is systematic, only now the population climbs upward to the interior. This allows the farmers both to work the fertile lands of their abandoned villages and, by maintaining the areas peripheral to their lands, to slowly push back the limits and increase their territory.

2.1 SEMI-MANAGED AREAS

The food crop gardens are often located between 100 and 400 metres, above the narrow coastal fringe and are separated from the village by coconut plantations and cattle farms. This is because there is more fertile and irrigable land available at higher altitudes. Additionally, the cultivated parcels are slowly being pushed outwards by the advancing plantations and soil degradation.

The 'traditional' and 'modern' means of using and managing the natural milieu have been documented for the villages of Elia, Kerepua and Wusi. The study and mapping of subsistence agriculture areas (both rain watered and irrigated) as well as cash crop areas has highlighted the importance of the intermediate forest zones. These intermediate forest zones contain semi-managed areas, specifically designated for gathering, fishing, hunting and trapping.

The few abandoned settlement sites of the present coastal population continue to be minimally maintained as well as the paths leading to them. They represent 'semi-managed' areas and function essentially as food reserves. They are periodically maintained during forest travel, for example, when the villagers, particularly those of Elia, go to visit their mountain relatives for a marriage, death or even to work in the gardens[8]. They might also be maintained during hunts organised in these same valleys and hills.

> *Within these areas are found various woody and non-woody, food, useful and precious plants: the leaves to make lap-lap*[9]*(Heliconia sp.), fruit trees (*Musa *sp.,* Mangifera indica, Citrus, Carica papaya, Spondias cytherea, Syzygium malaccense, *etc.), nut bearing trees (*Terminalia catappa, Canarium indicum, Barringtonia *sp., etc.), yam variants considered as 'wild' by the cultivators (*Dioscorea *sp.), figs (used for their vines), manioc reserves (*Manihot esculenta*), palm trees for the confection of roof leaves (*Metroxilon warburgii*), Pandanus tectorius (for the making of mats and baskets), various trees used for their wood (for heating or for working:* Gyrocarpus americanus, Hernandia moerenhoutia, Pterocarpus indicus, Kleinhovia hospita, *etc.), and sandalwood.*

By maintaining these trees and plants within the forest and along the paths, the inhabitants appropriate specific forest areas for their use. These areas are distributed along either side of the rivers which long ago they descended on their way to the coast. The primary function of their genealogical knowledge, which rarely extends further than one or two generations beyond their grandparents, is to remember and to reconstruct these previously occupied ancestral territories which are today uninhabited.

These 'semi-managed' areas are 'socialised' both communally and individually. Trees are marked with a machete cut or a vine or rope knotted around them. This indicates that this tree (for example, a sandalwood tree), this plant, these fruits are reserved for a particular person. No one will touch the plant, and if someone infringes on this rule he/she will receive the same treatment. By the same token, along the forest paths leading to gardens and into the forest there are certain trees which seem to be 'natural storehouses'. A woman will deposit some yams in the hollow of a trunk to germinate while waiting to be replanted. There they are hidden by leaves and protected from rats. Elsewhere, someone has hidden two yams that someone else (often a child or an adolescent) will later retrieve to plant in their own garden. Bananas or other fruits gathered while they are still green will be hung from the branches of a tree where they will ripen sheltered from the rodents and away from the nests of snakes that often infest banana trees. This also avoids their frequently difficult transport on the steep and often slippery pathways leading to the villages. A name or a message or the name of the tree may be engraved on a trunk. In this way, the 'forest knowledge'is preserved or a someone leaves a trace of their passage. Thus the limits of the natural wilderness seem to be pushed back or modified by this 'socialisation'of the plants and the zones in which they occur.

2.2 VILLAGE VARIATIONS IN SUBSISTENCE SYSTEMS

The present population of Santo's western area has been affected by a number of social upheavals. These repeated perturbations were the result of numerous migrations which brought into contact distinct communities within the same coastal area. They transformed the rhythm and the way of life of the inhabitants. Once on the coast, these initially inland dwellers had to live with villagers whose culture and dialect were different. They were also confronted with a new physical environment and climate. At first they attempted to reproduce their previous way of life. However, given the environmental differences and new demographic pressures, they soon had to modify their agrarian practices, and hence some of their dietary habits and slowly their vision of the world. Each group used its own ingenuity in the modification of the physical and intellectual relationships it maintained with the natural environment, wild and cultivated.

There are significant variations from village to village in the agrarian systems of Santo's western coast, despite the small distances which separate them (5 to 10 km). They are as much due to environmental as cultural factors. These populations practice slash and burn shifting agriculture in the cultivation of rain watered gardens of yams and taros. They also create vast irrigated and diversified complexes for the cultivation of taro. These are often under tree cover or coconut plantations. Other complementary food crops are also cultivated there such as breadfruit, banana, manioc (cassava), Fiji taro, etc. There are 'agro-forests' where breadfruit trees, numerous mango trees (which tolerate drought well and thus indicate semi-arid zones), citrus trees (grapefruit, orange and lemon), nut bearing trees and other fruit trees are grown and regularly replanted. These 'agro-forests' are cultivated on the outer limits of the villages, on abandoned village sites, along paths or on the peripheries of food gardens.

Figure 4: (See appendix photos)

In collaboration with A. Walter (ORSTOM) and M. Bourke (ANU, Canberra), data have been collected to identify the different agricultural systems that these village inhabitants use. It is principally the methods used in the production of staple foods (taros and yams) as well as the production of secondary plants and, to a lesser degree, commercial plants (coconuts - copra, cocoa and kava) that have been documented.

The factors which differentiate the agrarian systems in the villages of western Santo will be emphasised. Wusi and Kerepua have closely related subsistence systems as do Elia and Tasmate. However, each village has its own techniques for farming and harvesting, methods of maintaining soil fertility and fallow periods. The areas where staple crops are grown, the importance of a crop within the daily diet and the symbolic value that the villagers give them also differs from village to village. It may even differ from one group to the next within the same village. There are also variations in quality, quantity and the arrangement of plants grown in association with the primary plants. Finally, the place given in their agriculture and their diet to introduced species (such as Fiji taro (macabo), *Xanthosoma sagittifolium*) has recently changed in all the villages. These variations are due to both cultural choices and the identity of these migrant peoples living on the coast as well as their adaptation to significant environmental constraints.

This study was specifically interested in two types of plants: those grown in rain water plantings and those cultivated in irrigated plantations. In each case, we looked for the elements that distinguished one village from another. The study of these cultivated plants and their circulation will allow us to highlight the rich diversity of the relationships among the coastal village peoples, and between them and their mountain relatives.

2.2.1 Slash and burn shifting agriculture: 'dry' yam and taro gardens

The inhabitants of Santo's western coast cultivate two types of gardens which they classify as 'dry'(irrigated by rainfall or cultivated on river banks and where mostly yams and taros are grown) and 'humid' (irrigated taro plantations)[10]. Other useful food plants are grown in association with the taro or yams such as the cultivars *Abelmoshus manihot, Piper methysticum, Xanthosoma sagittifolium, Musa* sp., *Pandanus tectorius, Mextroxilon warburgi*i, etc.

In **Wusi,** yams are the dominant crop *(Dioscorea alata)* and occupy more than 33% of the cultivated areas. Manioc *(Manihot esculenta)*, taro *(Colocasia esculenta)*, sweet yams *(D. esculenta)* and coconut palms occupy from 10 to 32%, while banana trees *(Musa sp.)*, sweet potatoes *(Ipomoea batatas)*, breadfruit trees *(Artocarpus altilis)* occupy only 2 to 10%. In 1996, the average surface area of the parcels dedicated to yam cultivation in Wusi was 220 m^2 per person, or 253 m^2 per adult ('adult equivalent'). The regenerated vegetation on fallow parcels (only cultivated one year before being abandoned), is primarily composed of 3 to 4 year old trees (primarily bamboo's) reaching a height of 4 to 8 metres. The fallow time for 'dry' gardens (yams and taros planted in rain watered gardens) does not exceed 3 to 4 years. The density of yams when planted is 0.91 plants/m^2. The production of the *D. alata*, when harvested is 19.1 tonnes/hectare. The yams are planted without any real earthing up of the plants in relatively dense soil, which has nevertheless been cleared of cumbersome stones and roots. They are often planted on steep slopes or in dry soil, which inhibits the lengthwise development of the tubers. Bamboo stakes offer vertical support to the yam vine shoots and thus, according to the farmers, ensure good growth and maximal ripening. These gardens are planted seasonally from September to November. The first early yams ripen in April (*D. esculenta* and *D. rotundata* called "six month" in Bichelamar) whereas the late yams will only be ripe in June. In August and September, the last tubers are harvested. Some are consumed and some are stored on elevated granaries until it is time to plant the seeds. The clearing and burning of new parcels takes place from September to November. Often this is reduced to clearing the undergrowth on an old garden which has lain fallow for the past 3 or 4 years, followed by burning.

In **Kerepua** , slash and burn shifting agriculture is principally used in the cultivation of taro *(Colocasia esculenta)* and yams *(Dioscorea alata* and *D. esculenta)*. These two plants are of equal importance, however, taro is also cultivated in irrigated gardens. Each parcel is used for only one year before being left to fallow. The regrowth includes bamboos as well as trees ("tall woody regrowth") that are more than 15 years old. The secondary food crops are sweet potato *(Ipomoea batatas)*, Fiji taro *(Xanthosoma sagittifolium)*, breadfruit *(Artocarpus altilis)* and coconut.

In **Elia**, irrigated basins used in the cultivation of taro are the primary agricultural system. Slash and burn shifting agriculture plays a secondary role and is used principally

in the cultivation of yams (10 to 32% of the cultivated areas) followed by Fiji taro, manioc and sweet potato. Breadfruit is also an important crop. The regenerated vegetation on fallow plots ("tall woody regrowth") is generally cleared after a fallow period of sometimes more than 15 years. A parcel is planted only once before it is abandoned. In gardens that have been harvested, plants are left in the ground or are replanted to serve as a food reserve for the inhabitants as well as the domesticated pigs *(Manihot esculenta*, coconut palms, *Xanthosoma sagittifolium*, Musa sp., sweet potatoes...). In Elia, the density of yams at planting is 0,89 plants/m^2. As in Wusi, Kerepua and Tasmate, earthing up techniques are rudimentary and staking is important. Planting takes place from September to December, after the first rains, and the plants are harvested from April to October.

In summary, the farmers of Wusi principally use shifting agriculture of yams whereas those of Elia tend to cultivate taro in irrigated basins. Nevertheless, in Elia between 1995 and 1997, the average surface area of new yam gardens significantly augmented (for some families it doubled). Indeed, it has outstripped the results found at Wusi. This does not mean that the inhabitants of Elia have suddenly become yam cultivators but rather that they have decided to increase the size of their coconut plantations. As a first step, they cleared 200 m^2 of land per family in 1995 and 500 m^2 of land in 1997 at the edge of the sea or on the hillsides. Profiting from this clearing and these new fertile lands, the first year they cultivated yams.

> *Most of the yams planted at Elia and Wusi are* D. alata *(52-56%), followed by* D. esculenta *(21-23%),* D. nummularia *(9-13%) and then* rotundata, bulbifera, pentaphylla *and* trifida *(1-3%). Nevertheless, there are more species designated by the cultivators as 'wild' in Elia (4-6%* nummularia*, 1-2%* esculenta*, 1-8%* bulbifera*, 1%* pentaphylla*) than in Wusi.*

2.2.2 The 'humid' garden complex: the irrigated taro plantations

Large hydraulic systems conceived for the irrigated cultivation of taro still exist on the western coast of Santo as well as on several other islands to the north. The intensive and diversified systems of Elia were studied in detail. There, the farmers irrigate 17.000 m^2 of land for the cultivation of taro *(Colocasia esculenta)*. The installation of these systems, whose origin is still unknown, dates from at least 400 or 500 years ago. Over time, the population has rearranged as needed the old taro plantations whose structures remain a visible part of the landscape. These structures, once converted are used continuously for 20 years or so. Then they are left to fallow for a period that is at least

equivalent, but which can be as long as 50 years. The enormous advantage of this type of cultivation is that the farmers are no longer subject to the seasons. Taros are planted every month and continually produce food during the whole year.

> *Sewu is a large taro plantation of 8,500 m² and 120 basins. It is situated in Elia and has been active for the past 16 years. The size of the basins varies from 10 to 700 m², but on average is between 50 and 70 m². Each year the newly irrigated surface area is 200 to 800 m² and each adult is able to cultivate annually 800 to 1000 m². All the basins are separated by supporting walls. which are themselves cultivated. They provide a surface area of about 1,500 m² for the cultivation of secondary food crops.*

The density of the planted taros is 2.5 plants/m². 38 of the 69 recorded clones are observed. This indicates that the biodiversity of this plant within the species has been well preserved. The taros are harvested after about 12 months, the time necessary for the corms to mature. The average weight of these corms is 1.25 kg which gives a yield of 31 tonnes per hectare (20 - 44 tonnes/hectare) or 360 kg/yr/person.

About thirty different secondary food crops are cultivated on the separating walls *(Abelmoshus manihot, Piper methysticum, Saccharum edule,* etc.) as well as fruit trees *(Musa* sp., *Barringtonia* sp., *Citrus macroptera, Carica papaya, Artocarpus altilis,* etc.) with a density of about 83 fruit trees/hectare. At the beginning of the colonial period, the cultivators planted a veritable coconut plantation on these walls. Its density (177 trees/hectare) is only slightly less than that of a normal coconut plantation.

> *The work of the taro plantation is performed by a group of families. These families are linked through kinship ties and alliances of varying duration. For security, in this area of hurricanes and landslides, a farmer will cultivate several basins in a number of different taro plantations at the same time. The network of alliances allows a farmer to replant old basins, maintain a taro plantation to which he is attached and even to have access to lands which do not belong to him. It is activated in such a way that several families maintain a large taro plantation, whose renown will be passed down from generation to generation.*

In Wusi, the availability of irrigable lands as well as the means of irrigation are limited. Although the population is growing slowly (53 people in 1989; 95 people in 1998), it is nevertheless growing at a constant rate (ten births every two years).

Although demographic pressure is small (53 people in 1989; 95 people in 1998) its increase is nevertheless constant (ten births every two years). Additionally, the inhabitants do not possess much rich arable land. The pressure of man on his environment can be seen in the type of regrowth on fallow plots but more especially in fallow periods which have now become too short. As the irrigated terraces are very narrow (1 - 2 metres wide) and the soil friable and stony, this traditionally non-seasonal cultivation has become seasonal here. A basin is only used for a year before it is abandoned. In Kerepua, the situation is similar though less severe. The basins of the irrigated taro gardens are narrow, not exceeding 2.5 metres wide and 10 metres long. They are cultivated 3 to 6 years before they are left to fallow.

2.3 TRANSFORMATION OF DIET

The alimentation has remained traditional in the communities of Santo's western coast. Their diet is almost exclusively made up of the products cultivated in their gardens or more rarely, gathered in the forest. This is partially explained by their isolation and their difficulty in obtaining cash.

Nevertheless, introduced species are used by the different communities but again their specific usage varies from village to village. For example, the quantity of starches consumed per inhabitant is equivalent for the three villages of Elia, Tasmate and Wusi. However, more Fiji taro is eaten in Elia whereas there is a greater consumption of manioc in Wusi and in Tasmate these introduced tubers are almost not eaten at all (Figure 5). In reality, Fiji taro and manioc have not replaced the local tubers, rather they allow the re-utilisation of land already impoverished by cocoa cultivation or the use of poor or infertile land. These communities can thus insure food security through the use of easily cultivated introduced tubers with no negative effect on the cultivation of the primary plants and with less work. While in Elia, the introduced tubers are an appreciated food reserve, in Wusi, they are an indispensable source of food in a very eroded environment. Moreover, in Tasmate and Elia, the daily diet is based on non-seasonal tubers, such as taro, whereas in Wusi, it is based on the cultivation of seasonal tubers: yam and taro. Thus the cultivation of Fiji taro and manioc frees these populations from seasonal constraints and ensures them of a better food security.

Figure 5: Total quantity of starchy products (pealed and ready to cook) consumed daily per person in the three villages studied (numbers are in kg/day/person)

	Elia	*Tasmate*	*Wusi*
Taro	0,808	1,439	0,934
Yam	0,272	0,021	0,114
Fiji taro	0,365	0,000	0,848
Manioc	0,537	0,000	0,838
Banana	0,206	0,272	0,092
Tahitian chestnut	0,090	0,300	0,000
Corn		0,150	0,200
TOTAL	2,279	2,182	2,188

The study was made in January, a month when few yams are available as it falls between two harvest periods. Thus the recorded quantities for yam consumption in the three villages are underestimated. In Wusi, it is during this period that taro is eaten. Paradoxically, in the absence of regular irrigation the cultivation of taro in Wusi has become seasonal. Elsewhere, the consumption of taro is predominant and continues throughout the year. Tahitian chestnuts, corn and later on in the year, breadfruit, are important seasonal foodstuffs that complete the daily dietary intake.

The sources of protein continue to be wild pig, hunted once a week, wild cattle hunted periodically, chickens, goats, fish, eels, bankul worms and certain nuts. Although the quantity of protein remains small, nevertheless it appears to be sufficient.

The amounts of commercial rice, preserved fish or meat, oil or even salt that are consumed appear relatively insignificant. However, these commercial products are difficult to come by both as the village stores are poorly stocked and as there is little money available with which to buy them. It can be observed that Wusi, which is closer to Luganville and has more financial resources that its neighbours, also uses more imported food stuffs.

3. CONTACT WITH THE OUTSIDE WORLD

3.1 COMMERCIAL CROPS

The first Europeans explored the island of Santo with a view to exploiting its sandalwood. It is easy to imagine how little this European expedition would benefit the inhabitants of the island.

Much later. it was the draw of copra production that lead numerous island communities to descend form the mountains to the coast. This production still remains the principal means of obtaining cash. However. as the price of copra has diminished considerably over the past few years (from 30 to 20 vatu/kilo. or from 1,5 to 1 FF/kilo). the income from the sale of copra for Santo's western coast inhabitants is modest. Given an average price of 23.000 - 28.000 vatu/tonne. copra brings in 22.500 to 67.500 vatu/yr/family. that is to say. between 1125 and 3375 FF per year per family. To this revenue can be added occasional income from crafts and the sale of sandalwood. With this money the children's schooling must be paid and everyday needs provided for (soap. salt. sugar. clothing...). Sometimes provision must also be made for exceptional but expensive events such as buying a wife (about 80.000 vatu. 4.000 FF). In Kerepua. the income from copra and sandalwood are similar to that observed in Wusi. In Elia. the income from copra. in addition to a small trade in cocoa. kava and sandalwood. is very small. Nevertheless. if a family manages to sell a lot of sandalwood (20 FF/kilo). as was the case in 1998. it can double its income for the year.

Beginning in the 1970's, besides the commercial crops that were part of the colonial heritage, the inhabitants of the western part of Santo have also become involved in the cocoa trade. However, this trade remains difficult and is still small scale with little productivity. Only the inhabitants of Tasmate and Elia still sell cocoa in small quantities. As a result, the cocoa plantations, generally situated in low altitude forests, have become areas where the inhabitants now plant Fiji taro, corn certain palms, etc. alongside the cocoa.

As a result, the inhabitants now plant Fiji taro, corn, certain palms, etc. alongside the cocoa on the plantations which are generally situated in low altitude forests. The inhabitants are diversifying and hence optimising these areas, which are once again useful.

Sandalwood is still being bought by traders from Taiwan and New Zealand for 350 to 400 vatu/kg (less than 20 FF per kilo). However, this species of tree, cut in quantity at the end of the last century and the beginning of this one, has become rare and as the inhabitants almost never replant the trade is dying out. At this time there is no logging activity on Santo's western coast. However, logging with replanting is taking place in the north-west of the island at Wupoko and Petawat. Most of the trees logged here are cut in the sawmills close to Luganville.

Today, the inhabitants principally of Elia and Tasmate are becoming increasingly involved in the production and trade of kava (Piper methysticum). They plant the kava on the walls and around the perimeters of the irrigated taro plantations as well as on their abandoned lands close to the Apuna and Raovi Rivers, not far from the road to Big Bay. Indeed the kava market is in full expansion. Its development is enhanced by the demand of 'kava bars' in town (more than 50 in Luganville and over 100 in Vila) and of pharmaceutical companies, which are interested in its properties, notably as a tranquilliser (American, German, French,...), and of Melanesian merchants living in Australia (Sydney and Melbourne) where kava is principally consumed by members of the ni-Vanuatu, Fijian, Caledonian and aboriginal communities.

The inhabitants of Elia also harvest small quantities of "nangaille" nuts (Canarium indicum) in order to sell them in Luganville at a price close to that of copra. In the eyes of other Vanuatuan inhabitants (notably those from Malekula and Banks), they are not the major producers of this type of nut but rather seek to promote one more of their natural resources. In the same way, they might become involved in the production of taro for export, if the market were to open up. The inhabitants are attentive to new market demands, are willing and enthusiastic although they remain subject to the limits of their environment whose least resource they exploit. Finally, it is the absence of transport infrastructures that remains a major obstacle to their entry into the modern world.

3.2 Entering the modern world

3.2.1 Transport infrastructures

The south-eastern region and the southern and eastern coasts are connected to Luganville by large roads. Recently, these routes have been extended as far north as Big Bay and to Tasiriki in the south-west. However, the absence of transport infrastructures on the western coast means that this area remains isolated and difficult to reach.

Wusi is the least isolated of the three villages studied. Its more southern location, its more significant financial resources and boats that are in better condition facilitate communication with and travel to the southern part of the island and Luganville. The involvement of the inhabitants in the sale of copra and in a well developed trade of handicrafts as well as growing investments in Luganville all contribute to increased financial resources as well as links to both the coast and Luganville.

For the inhabitants of Elia, on the contrary, travelling to the south of the island or Luganville remains an often hazardous and expensive expedition. The boats are rarely seaworthy and the inhabitants can seldom afford the boat fare from Elia to Tasiriki to reach the road. Instead, they cross Santo on foot from west to east, a walk of one or two days covering about 30 km. This will eventually bring them to the road from Big Bay to Luganville which they will follow on into town. Alternatively, they can also go to Wusi

(12 km to the south of Elia) by following the coast, again on foot. From there they can join the people of Wusi on their way to Tasiriki and finally Luganville.

3.2.2 Handicrafts and Tourism

In Wusi, the production of pottery, mats and baskets to be sold provides another source of income to the inhabitants besides the production of copra. These craft objects are sold to the few tourists travelling along this coast (generally by boat), to visiting sandalwood traders or even to government agents (health care, nutrition,...). When financial resources and good seas allow, the inhabitants travel into Luganville to sell small quantities of their handicrafts.

In Elia, objects are also crafted - wooden dishes, arrows - which are sold with some difficulty through the intermediary of the inhabitants of Kerepua and Wusi.

Finally, in Kerepua, handicrafts - arrows, bows, lances, etc. - either transit through Wusi where they are sold or they are stored until visitors (sandalwood traders) or, more importantly, researchers (botanists, ornithologists, entomologists, geologists,...) and tourists (Japanese, Australian, American, French and ni-Vanuatu) arrive in the village. These outside visitors often come to Kerepua looking for a guide to accompany them to the summit of the nearby Mount Tabwemasana. This service is paid, a guide receiving 700 to 1000 vatu per day (35 to 50 FF/day).

Thus it is that the villagers manage the diverse resources of the forest. They turn its least possibility to their advantage. This includes the cultivation and gathering of products such as kava, nuts and wood, the fabrication and sale of handicrafts and the promotion of specific aspects of their natural environment such as Mount Tabwemasana. Their subsistence system is founded on the management of the biodiversity, its utilisation and hence its conservation, as well as its diversification.

CONCLUSION

The present coastal inhabitants are not mountain peoples, nor are they coastal peoples although they have been living there for several decades. These inhabitants of the coasts were and remain river peoples (Apuna, Raovi and Pua Rivers). They followed these rivers down to the sea, passing through Woke and Wunaaro. Throughout this time they continued to cultivate and maintain the surrounding mountain or coastal lands. This movement along the rivers is still taking place today, the inhabitants now ascending towards the interior forests. It is propelled by the need for land and new demographic pressures (the present coastal inhabitants, previously living in dispersed habitations have now collected into today's coastal Christian communities). Living in relative isolation, these villagers are drawn to the road to the north, accessway to Luganville and to the world. This road runs close to the lands that they have abandoned although they continue to use the lands' resources and cultivate the adjoining areas. They also continue to maintain close relationships with their mountain kin.

It is around these rivers, waterways and springs that the inhabitants articulate their particular ways of using and representing the environment. Thus the rivers are strategic sites for the observation and analysis of many different aspects of these societies. The documentation of the genealogies of these inhabitants has shown that the migratory dynamics of the past, as well as those of today, occur around and along these rivers. The rivers are essential. Not only are they an important source of protein (fish), but they also allow the development of large agricultural networks, are used as a means of transport and determine an area of influence where the inhabitants hunt, fish, and farm. The rivers are also home to numerous spirits which occupy the banks - rocks, trees and roots - and the waters. The rivers thus clearly function as a central axis around which the multiple material and symbolic relationships that these societies maintain with their natural environment (wild and cultivated) are developed, transformed and consolidated. It is also around the rivers that the complex networks of alliances between people are woven.

Today, there are a number of factors which could lead some of the inhabitants to re-ascend 15 to 20 km back towards the interior forests. These include: the isolation of these villages and their distance from the roads, the extremely modest income from cash crops, the erosion of the coastal hills, the progressively increasing distance to the cultivated areas as well as a certain nostalgia for life in the mountainous forest. In these interior forests also live or have returned those communities which did not migrate at the turn of the century and with whom the migrants never lost contact.

It is not clear at this time whether the coastal inhabitants will remain in the settlements in which they presently live. Some villagers wish to leave but they control this demographic scattering by conserving a habitation and plantations. Others want to move back towards the lands and rivers of abundance such as the Apuna and the Raovi, or to settle close to the road to the north tempted by the economic perspectives of the new trade in kava. Indeed, this road, this 'white snake that is sleeping' ("wan waet snak we i stap slip") as the older people call it, is the access route to economic possibilities and the modern world from which the villagers feel cut off at this time.

Some of the coastal inhabitants wish to remain on the coastal fringe. It is familiar, Christian and a modest income is still ensured there. Certain inhabitants refuse to return to the abandoned lands of the interior because they are afraid of 'assassin spirits' hidden in the forests. These inhabitants, such as those of Wusi, have lost the traditional knowledge that protects them against the 'darkness of the bush' ("darkness blong bush"). However, those who still posses this knowledge, as is the case in Elia, have little fear of these spirits.

Today, if a complete and generalised return of these populations towards their initial sites seems improbable, migration linked to the appropriation of abandoned lands and dispersal close to the gardens does seem to be taking place. Thus the population is moving closer to the road between Big Bay and Luganville, the access route to town, and its hypothetical extension to the Apuna River. At this time the inhabitants of the western part of Santo are principally concerned with the forest areas between the coast and the north of the island, areas which they maintain, manage and socialise.

APPENDIX PHOTOS

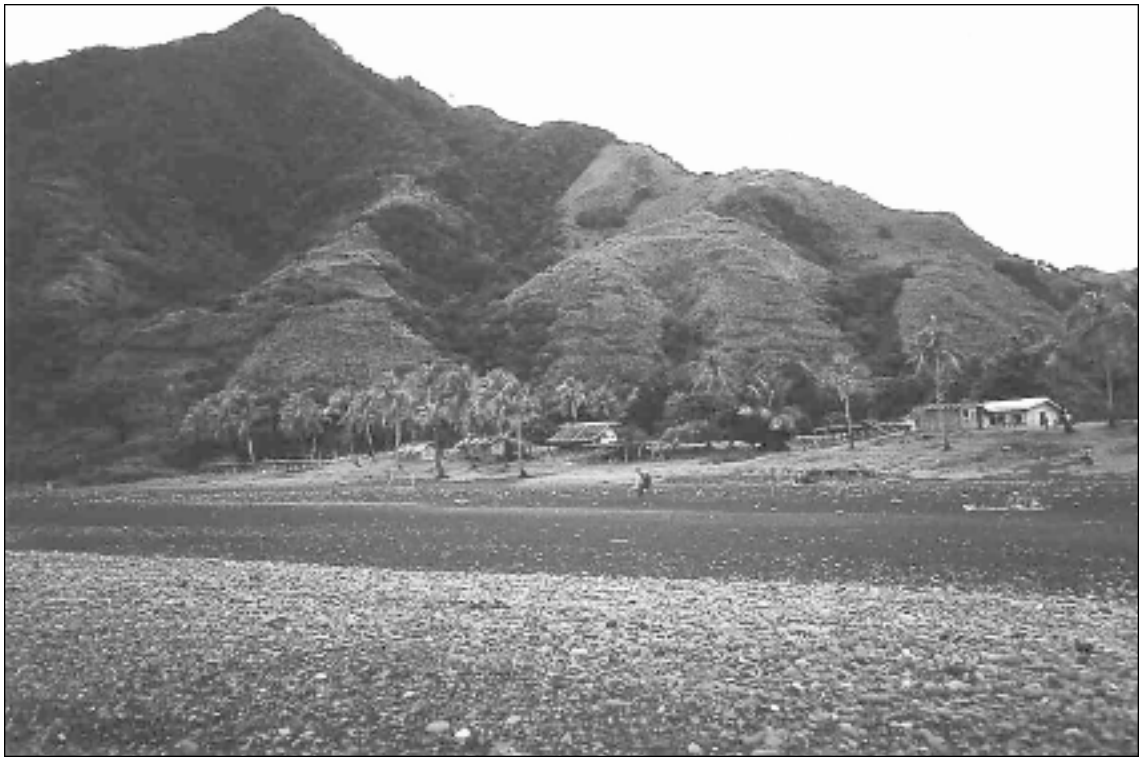

Photo 1: Wusi village, west coast of Santo

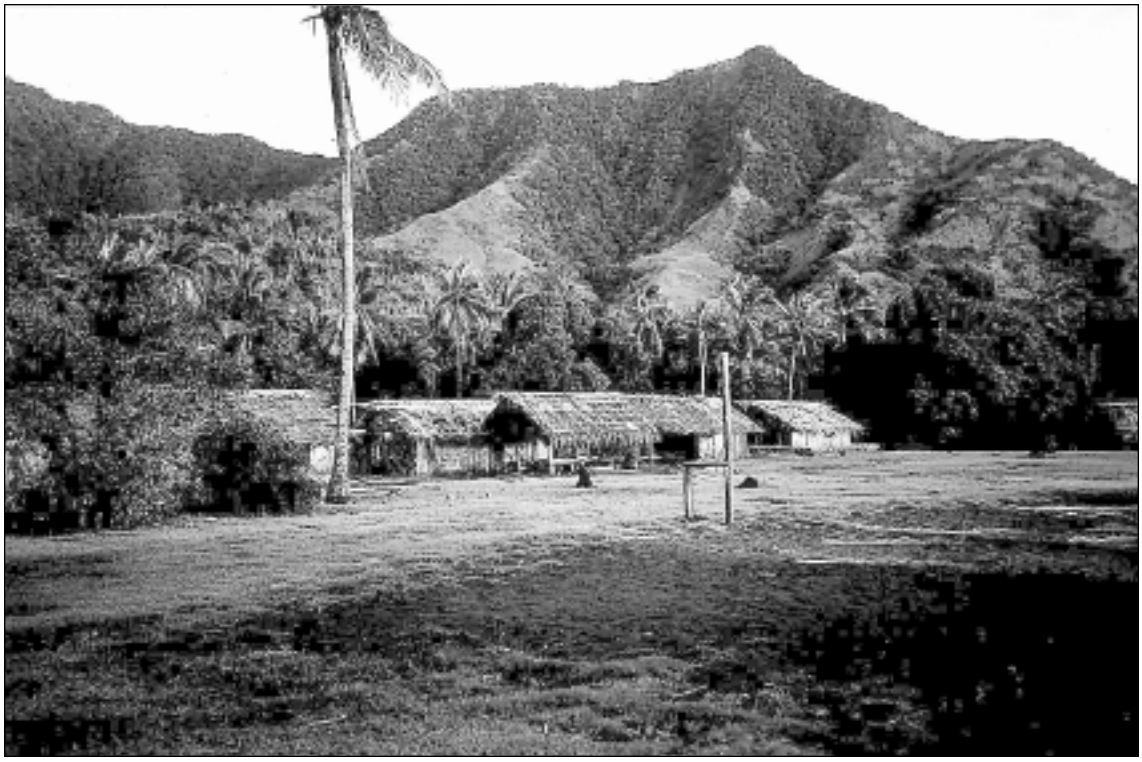

Photo 2 : Elia village, west coast of Santo (located 12 km north of Wusi)

Photo 3: Garden of yams inWusi

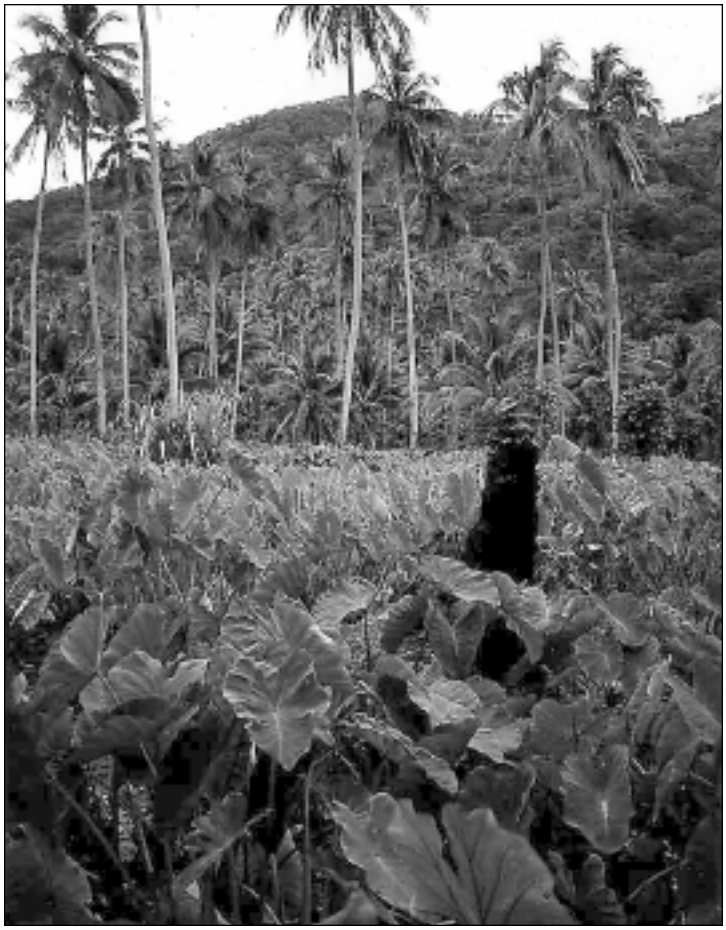

Photo 4 : Irrigated plantations of taros in Elia

ENDNOTES

1 Santo's western coast is on the leeward side of the island. It has a hot tropical climate (average temperature of 26° C and rainfall of 1 - 2 metres, Quantin, 1976) with a marked dry season from June to September.

2 People traded along the coast but also with groups further inland. The inhabitants of the present village of Elia traditionally traded with the inhabitants of the south of Santo. They traded their "narawe" (highly valued pigs, hermaphrodite and sterile, whose parents are specifically selected) for pigs without any genital abnormality (a "narawe" is the equivalent of 12 normally sexed pigs).

3 Today this household only lives off and on at Slakipey (Elia locality) which is close to its plantations and for most of the year lives at Totoyere (close to the Tavol River) on the northern part of the island (Religion: Seventh Day Adventists).

4 This family left its mountain village at the end of the 1980's, moving to Anawe in the back country of Elia and then to Kwona (on the coast). In 1998, the family left Kwona for a new hamlet further north on the coast, Wunaruu. The family started a garden (Discorea sp., Manihot esculenta, Musa sp., corn, peanuts...) below a young coconut plantation covering more than 1,000 m^2. This family is planning to move close to the village of Malao soon (Presbyterian and SDA), on the banks of the Apuna River at Big Bay.

5 3 deaths and 3 births. For the villages of Elia, Tasmate and Wusi there were, on average, 10 live births per village between 1996 and 1998.

6 The languages that are spoken on Santo's western coast have been named by D.T. Tryon, Wurm and Hattori according to the village or area where they occur: "Tolomako", "Tasmate", "Wusi", "Akei", "Malmariv" and "Navut". All these languages are related and are inter-intelligible. The "Tolomako" language is spoken in Wunavay (north of Tasmate). The languages of Sulesia and Vasalea, closely related, are also linked to that of Tasmate. In Tasmate, several languages are spoken. The "Tasmate" language group is dominant and is spoken by 70% of the population. The other languages have fewer speakers and include the languages of "Wusi" and Big Bay ("Tolomako" and "Malmariv"). In Kerepua and Wusi languages of the "Wusi" group are spoken (75% of the population). The languages from the "Tasmate", "Navut" and "Akei" groups are also spoken. In Linturi, the dominant language is that of the "Navut" group (80% of the population of about 40 inhabitants) followed by the "Tolomako" and "Malmariv" groups (the village of Winsao). In Linturi one can also hear the language spoken in Narumats, a village close to the Saoriki River (a dialect of the "Akei" group). Elia is a special case as it has a large linguistic diversity. There are six languages distributed unequally amonst the 115 speakers. The dominant languages are "Wusi" and "Malmariv", followed by "Tasmate" (3 women from Tasmate married into Elia from 1996 to 1998). In addition a dialect of "Malmariv" is spoken by three persons, a dialect of "Navut" is spoken by two people, and finally there is one person of the "Tolomako" language group. Thus, in numbers of speakers, there are three major languages and three others of lesser imporance.

7 Such a breach of tradition nevertheless has repercussions for the children of this couple. They are not allowed to use the traditional name normally given by the father to his children (this traditional name is directly linked to the father's lineage). Previously, however, and particularly in Kerepua, the couple, (called "brother" and "sister") that was guilty of such a violation was killed.

8 Conscious of the growth of the kava market (Piper methysticum), some of Elia's inhabitants have planted large gardens of kava close to the villages of their relatives. This is the case in Maaltia or Tovoti, situated close to the Raovi River and fifteen kilometres from the road to Big Bay.

9 Lap-lap is a prepared dish based on tubers (taro, yam), bananas or manioc. These foodstuffs are grated raw then wrapped in the leaves before being braised in a stone oven. They can also be cooked in the same way but pealed and cut into pieces rather than grated. For a feast, they will be accompanied with meat (pig, chicken). On the west coast of Santo, "Nakira" ("Nalot" in Bichelamar) is also prepared. For this dish, the tubers are either boiled and then mashed on a wooden plate with the help of a pestle or they are grated and cooked in a stone oven in small packets formed from the same leaves. They will then be mashed with a pestle until the desired consistency is obtained and the paste sprinkled with coconut milk.

10 See for example: Barrau, J., 1968, "The Wet and the Dry: an Essay on Ethnobiological Adaptation to Contrasting Environments in the Indo-Pacific Area", in : Vayda, A.P. (ed), Peoples and Cultures of the Pacific, New York: Natural History Press.
Kirsch, P., 1994, The Wet and the Dry: Irrigation and Agricultural Intensification in Polynesia, New York and London: University of Chicago Press.

CHAPTER 2

LUGANVILLE: BETWEEN SEA AND FOREST

Delphine GREINDL

1. HISTOR Y

Luganville is the second largest town in the archipelago, after the capital Vila. Due to its geography and location, it is the country's principal port of entry and hub for the two main roads serving the southern and eastern coasts of the island. Its fourteen neighbourhoods[1] cover nearly 28 square kilometres between the Second Canal and the Sarakata River (Figure 1).

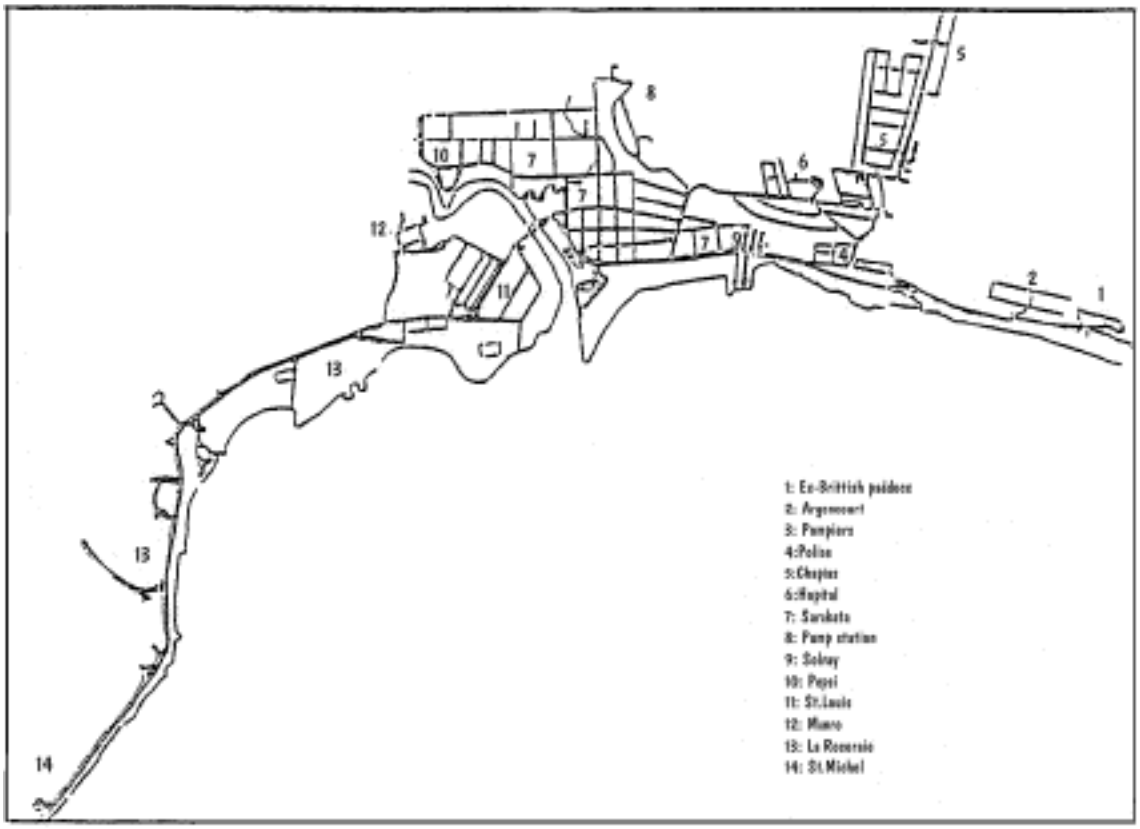

Figure 1: Map of Luganville

The 19th century brought commercial farming of copra, cotton, coffee and cocoa, along with the basic infrastructure needed by the colonists – houses, churches, schools, etc. It was during World War II, however, with the building of one of America's largest bases, that an artificial city for 200.000 men appeared, complete with roads, bridges, airports and sewers.

When the army vacated, leaving the landscape transformed but unoccupied, it was a simple matter to mark out individual lots for people from Santo's villages, other islands

and overseas. Gradually, the original owners resold the lots. With no regional planning policy, however, the town grew up haphazardly around the centre and the few main roads, and the population increased steadily. Until independence, there were many European descendants. Following the island's secession attempt, however, all French speakers, whether Melanesian or European in origin, were deported. They have never returned, even though the island is now a fiscal haven and tourist paradise.

The opportunity to own housing in town did not automatically improve the living conditions of Vanuatuans. Even today, some people live in flimsy or unsanitary dwellings, left over from the military base or settlements occupied by Tonkinese labourers.[2] The overall urban growth rate is very high, and the population doubles every ten years (Figure 2).

Figure 2: Population Growth

	1967	*1979*	*1989*	*1996**
Luganville	2.564	5.183	6.983	10.100
Vila	7.738	14.598	19.311	31.200
Urbanised	10.302	19.781	26.294	41.300
Rural	67.686	91.470	142.106	131.600
Vanuatu	77.988	111.251	168.400	172.900

* Estimated

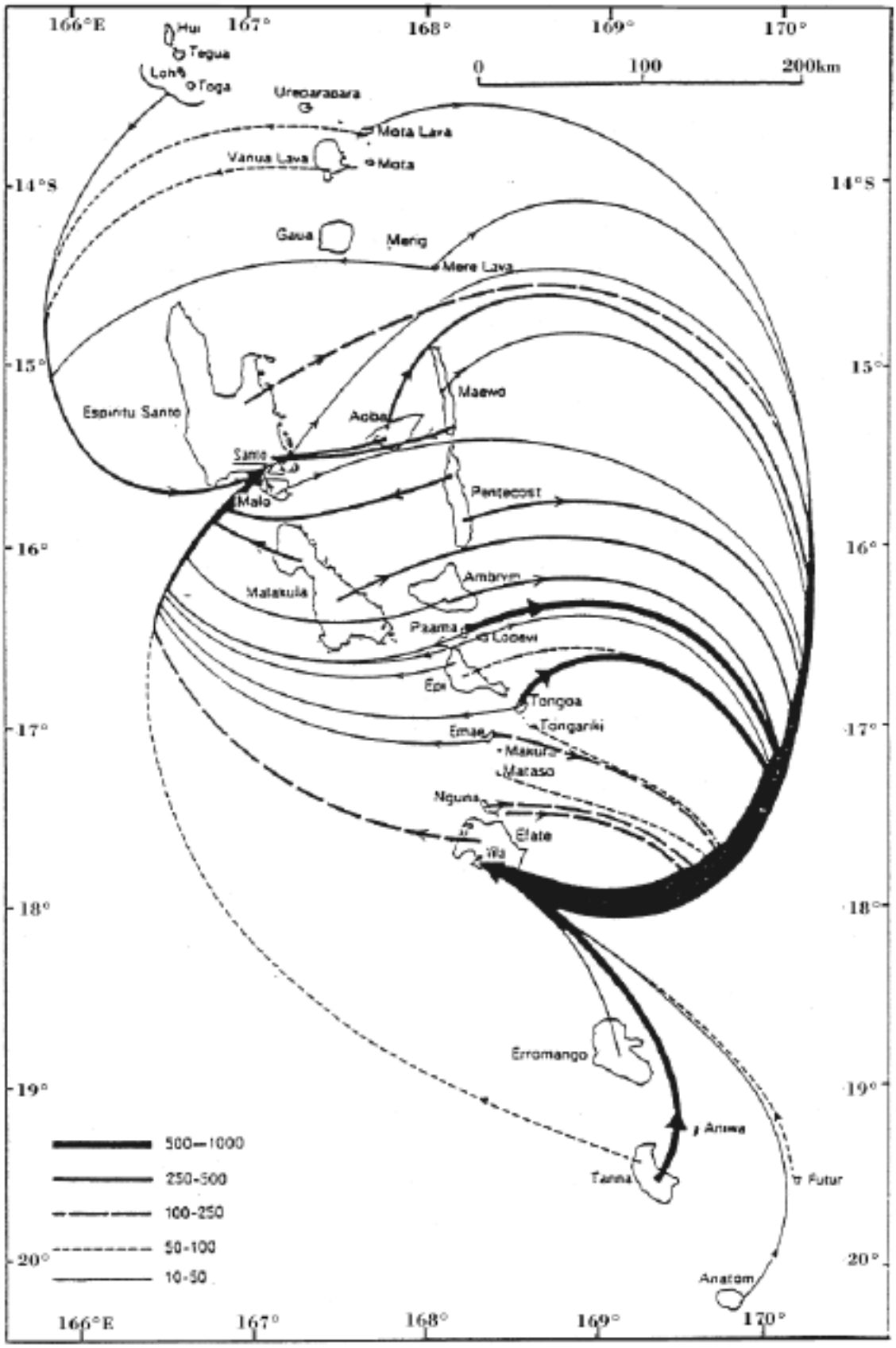

Figure 3: Map of the inter-island migrations in Vanuatu, 1979[4]

2. URBAN POPULATION

Even though 82% of the population lives in rural areas, Vila and Luganville attract many immigrants.[3] It is easy to understand the appeal of Luganville, being the only urban centre in the northern and central islands with modern sanitary, economic and social infrastructures. People come from all over the archipelago, and they tend to congregate in families, according to their village or island of origin (Figure 3).

Admittedly, the two urban centres of Vanuatu are small when compared to towns elsewhere. They nonetheless are notable in having an annual growth rate of 2.4%, among the highest in the world, and a very young population. Luganville is densely populated with 368 people per square kilometre, compared to 12 people per square kilometre for Vanuatu as a whole. Over half the population is less than 20 years old (Figure 4)[5].

Figure 4: Population of Luganville

Age	*Men*	*Women*	*Total*	*%*
0-4	680	556	1,236	17,8
5-9	508	408	916	13,1
10-14	391	397	788	11,3
15-19	363	393	756	10,9
20-29	720	702	1,422	20,4
30-39	500	442	942	13,6
40-49	284	195	479	6,9
50-59	139	94	233	3,3
60+	110	83	193	2,7
Total	3.695	3.270	6.965	100

Population of Mango neighbourhood

Age	*Men*	*Women*	*Total*	*%*
0-4	16	30	46	14,0
5-9	30	33	63	19,0
10-14	23	26	49	14,8
15-19	22	11	33	10,0
20-29	25	24	49	14,8
30-39	21	24	45	13,6
40-49	15	7	22	6,6
50-59	8	4	12	3,6
60+	6	5	11	3,3
Total	166	164	330	100

Many urban problems already are appearing. Housing construction is spontaneous and uncontrolled. Systems for health, education and employment are lacking. Diseases such as malaria and tuberculosis – linked to poor sanitation, water supply, waste treatment, pollution and the over-exploitation of the river and forest – are endemic.

Even though the growth in Luganville's population is due to natural births[6] (93%) as opposed to migration (7%), almost half of its residents came from other villages on Santo or from other islands in the north and centre of the archipelago. The town is a pole of attraction with its socio-economic, health and cultural resources – four schools, a district hospital and leisure activities. Rural villagers, now better educated, seek employment in the industrial, commercial and service sectors. They sometimes are spurred by tensions in the villages due to over-population or shortage of arable land. Unfortunately, these problems follow them to the town.

Migrants often come alone at first to look for work. Facing uncertain prospects, they move in with family members or friends who already are settled in town. Thus, the

ageing and decrepit housing stock becomes ever more crowded. Space for cultivation or domestic use is limited. Lacking garden plots, permission to gather firewood and fruit from nearby woodlands, or permits for fishing in restricted reserves, families often cannot become self-sufficient. People in the age range that is 'economically active' face an insecure future. To support families with many members, young and old, they must work very hard in paid employment, as well as in gardening and gathering.

A case in point is Mango, a neighbourhood of Luganville that was chosen for the study of dietary changes in the urban area[7]. Truly a 'village within the town,' for the past fifty years Mango has been the home of migrants from the Banks Islands in the north of the archipelago. The enclave is surrounded by sea, river, gardens, plantations and forest, making it quite unusual. It is further differentiated from the rest of the town, having been conceived as a housing development with about 30 parcels 'owned' by the municipality.[8] Mango is bordered by other municipal developments, already planned and subdivided but not yet sold. In this limited and precious green zone, the residents plant the gardens that provide their relative self-sufficiency. In the near future, these very limited areas must somehow stretch to meet the neighbourhood's needs, for the growth rate of Mango matches that of the town as a whole, with 60% of the population under the age of 20 (Figure 4).

This study will reveal how urban residents adapt to a new place, lifestyle and manner of relating to time. It also will permit analysis of their relationships with nearby environments.

The town is the hub of social and economic exchange, with food as the principle medium. Villagers trade with residents of the town, and urban migrants exchange with family members who remained behind. Modern imports flow out, while local and traditional products flow in from the forest, river and sea. It must be noted that 'forest' does not mean primary growth, rather managed land in the rural zones that soon will be taken over for habitation or gardens.

The analysis of food and its supply is a very interesting subject in urban development, as it will be a challenge to feed the continually growing towns. Residents do not always possess land or the time to work it, nor are all the fruits and vegetables available in their own gardens. The growth of a thriving municipal market is, therefore, an important factor in the socio-economic exchange between town and villages. Citizens depend on shops and the market to augment their food supply, while the villagers earn cash to pay for goods and services – from imported products to school fees.

Luganville also aims to expand through the construction of a new international airport and hotels, increased traffic through the harbour and diverse commercial projects. Still, the market is the primary laboratory for studying the urban diet and the relationship between the town and the villages.

3. FEEDING THE TOWN

Although 41% of Vanuatu is arable,[9] land utilisation differs on each island, depending on rainfall, composition, population density and other characteristics. The proportion of arable land per inhabitant has declined, however, from 4,5 hectares to 3,9 hectares between 1969 and 1979. The projection for the year 2014 is only 1,7 hectares per person[10]

In 1990 the Department of Agriculture and Forestry accounted for 23% of the gross domestic product (G.D.P.). Of this amount, 43% derived from subsistence farming and 57% from commercial agriculture – copra, livestock, logging, etc. Agriculture thus remains an essential part of the country's economy. Even 18% of the women's time is devoted to it. Food production is one of the pillars of Melanesian culture, not for consumption alone but for traditional obligatory gifts as well. Surplus produce is sold in town, and the proceeds contribute to the financial security of the family. Today it is estimated that over half of the archipelago's households grow food for subsistence, and 45% gain income from gardening.

The market, meanwhile, provides essential fruits and vegetables to ensure a varied, healthy and balanced diet. Thus, it is interesting to evaluate the influence of the market on food production in villages and on the diet in town.

3.1 THE MARKET

Studies of the market conducted from 1996 to 1998 show that it truly feeds the town – its households, institutions, restaurants and shops. Regardless of whether a family has a garden, every resident goes to the market at least once a week. Besides serving as the main source of fresh produce for urbanites and income for rural families, the market is a central gathering place. The vendors (Vanuatuan women from all over the island) [13] and their customers – Vanuatuans, Chinese, Europeans, Australians and tourists – meet and mingle. Calm and good humour reign.

The market is supplied by the various villages from the south, centre and eastern coast of Santo, and from neighbouring islands, principally Malo. The influx of people and produce underscore the need to participate in a national economy – to earn cash while continuing to live in the countryside. Hundreds of vendors arrive from dozens of villages every day of the year, except Sundays.

Participation in the market depends on access. Two major roads cross the southern and eastern areas, explaining the frequency with which certain villagers – from Fanafo, for example – can bring produce to town.[14]

The staple foods of Vanuatu were cultivated for their edible tubers, rhizomes, leaves, fruits or seeds. Over time, with increasing contact and exchange, village gardeners began planting an ever-increasing range of vegetables.[15] As a result, the market

now offers a wide selection of food species and variants. Indigenous plants, such as taro, yams, kava, breadfruit and nuts, are displayed alongside species that were imported long ago (bananas and mangoes) or introduced just recently (peppers, cabbages and gourds).

When analysed for quality and overall value, local products – e.g. bananas, coconuts or taro – always lead.

The following inventory of produce permits analysis by season, price per kilogram, frequency of supply, overall value, unsold goods, competition, etc. (Figure 5). The products come from cultivated gardens,[16] fallow gardens (i.e. fruit trees), and commercial farms (supplying coconuts, grapefruit, peanuts, etc.). Products from the managed woodland are more rare: ferns, wild fruits – e.g. *Dracotomelon vitiense*, *Passiflora edulis*, *Psidium guayava* – and nuts – *Barringtonia spp*,. *Canarium indicum*, etc. These fruits are seasonal and require transportation. Thus, they often are kept for private consumption, even though they are much in demand and command high prices. The inventory also lists firewood from common trees that are cleared from gardens. Seeds, handicrafts and other wares made from natural materials are catalogued – notably dishes, leaf mats and tools. Wild game – e.g. pig, flying fox, pigeon and coconut crab – are listed, too, though they appear only rarely. In contrast to many countries, the primary forests do not yield medicinal plants and precious wood species; thus, these do not appear.

The merchandise reflects surplus from private gardens, year-round cultivation (e.g. coconuts and bananas), and cash crops destined for urban consumption (e.g. tomatoes, nuts and kava). Even though commercial products are the same, regardless of village of origin, ‘regional specialities’ survive: ‘water taro’ *(Colocasia esculenta)* from the south and peanuts from Fanafo.

On studying the inventory, it is clear that certain products – e.g. kanak cabbage, banana, taro and sweet potato – are constantly available, while others – such as mango, pineapple, avocado, breadfruit and nuts – are seasonal Thus, though the supply of any one variety may differ according to the day or month, the range of products for sale is quite homogenous.

N°	Latin name	Common name	N°	Latin name	Common name
1	*Abelmoscus manihat*	"Island" cabbage*	53	*Petroselinum crispum*	Parsley
2	*Allium tuberosum, cepa var.*	Onion(s)	54	*Phaseolus vulgaris*	Green bean
3	*Ananas cocomus*	Pineapple*	55	*Piper methysticum*	Kava*
4	*Annona squamosa*	Sweet sop	56	*Polyscias spp.*	Polyscias
5	*Annona muricata*	Sour sop*	57	*Psidium guayava*	Guava*
6	*Annona reticulata*	Bullock's heart*	58	*Psophocarpus tetragonolobus*	Winged bean
7	*Arachis hypogea*	Peanut	59	*Raphanus sp.*	Radish
8	*Artorcarpus altilis*	Breadfruit*	60	*Saccharum edule*	Naviso*
9	*Artorcarpus heterophyllus*	Jackfruit	61	*Saccharum officinarum*	Sugar cane
10	*Averrhoa carambola*	Carambola	62	*Sechium edule*	Chocho
11	*Barringtonia spp.*	Navele*	63	*Sechium edule*	Chocho leaves
12	*Brassica oleracea*	Broccoli	64	*Solanum lycopersicum*	Tomato
13	*Brassica chinensis*	Chinese cabbage	65	*Solanum melongena*	Eggplant
14	*Brassica juncea*	Cabbage leaves	66	*Solanum tuberosum*	Potato
15	*Brassica oleracea*	Cabbage	67	*Spondias cytherea*	Ambaretta*
16	*Brassica sp.*	White bone	68	*Syzygium malaccense*	Malay apple*
17	*Canarium indicum*	Nangaille* (Nangae)	69	*Tamarindus indica*	Tamarind
18	*Capsicum frutescens*	Chili	70	*Terminalis catappa*	Natapoa*
19	*Capsicum annuum*	Pepper	71	*Theobroma cacoa*	Cocoa
20	*Carica papaya*	Papaya (Paw paw)	72	*Trichosanthes cucumerina*	Snake gourd
21	*Citrullus lanatus*	Watermelon	73	*Vigna unguiculata*	-
22	*Citrus grandis*	Pomelo	74	*Xanthosoma sagittifolium*	Taro leaves
23	*Citrus limon*	Lemon	75	*Xanthosoma sagittifolium*	Fiji taro*
24	*Citrus paradisis*	Grapefruit	76	*Zea mays L.*	Corn
25	*Citrus reticulata*	Mandarin	77	*Zingiber officinale*	Ginger
26	*Citrus sinensis*	Orange	78		Decorative plants
27	*Citrus spp.*	Lemon	79		Dried tobacco leaves
28	*Cocos nucifera*	Coconut heart	80		Lap-lap leaves
29	*Cocos nucifera*	Germinated coconut	81		Wooden handicrafts
30	*Cocos nucifera*	Green coconut	82		Bamboo fire tongs
31	*Cocos nucifera*	Coconut*	83		Lotus leaves
32	*Colocasia esculenta*	"Water" taro*	84		Shells
33	*Cucumis sativus*	Cucumber	85		Molluscs
34	*Curcubita moscata sepo*	Pumpkin leaves	86		Pig
35	*Curcubita moscata sepo*	Pumpkin	87		Chili bottle
36	*Daucus carota*	Carrot	88		Flying fox
37	*Dioscorea spp.*	Yam(s)*	89		Land crab
38	*Dracotomelon vitiense*	Nakatambol*	90		Coconut crab
39	*Inocarpus edulis*	Namambe*	91		Hen/Rooster
40	*Ipomoea batatas*	Sweet potato	92		Bougnat
41	*Lactuca sativa*	Lettuce	93		Tuluk
42	*Lagenaria siceraria*	Bottle gourd	94		Lap-lap
43	*Luffa acutangula*	Angled loofah	95		Cake
44	*Mangifera indica*	Mango	96		Roasted corn
45	*Manihot esculenta*	Manioc (cassava)	97		Decrative shells
46	*Mormodica charenta*	-	98		Various handicrafts
47	*Musa sp.*	Cooking banana*	99		Empty Coca-Cola bottle
48	*Musa sp.*	Dessert banana*	100		Wood
49	*Nasturtium officinale*	Watercress	101		Coconut oil
50	*Pachyrhisus erosus*	Yam bean	102		Mats
51	*Passiflora edulis*	Passion fruit*	103		Pandanus leaves
52	*Persea americana*	Avocado			

Figure 5: Inventory of the products available at the Luganville market

Products are sold by the unit – piece, basket or bunch – not by weight. Several factors influence the price – e.g. season, regularity of supply, ripeness, volume, species (indicates taste, texture, cooking time, etc.), date (may change on pay-day) and time of sale (sometimes reduced at the end of the day). The price also depends on the vendor's costs, the clientele, even the intended use of the product (everyday or ceremonial).[17] Many prices are fixed, regardless of vendor or season. Even without bartering, though, a smile often leads to rounding-off the amount.

Price competition does not exist, and the relationship of weight to cost is not very meaningful. If price doesn't vary, quantity does, which means that the 'price per kilo' differs considerably depending on the unit of sale. Large-sized products, such as tubers, fruits and vegetables, are thus more costly than small items, even though this is totally unjustified from a nutritional or economic point of view.

Similarly, the cost per kilo of local staples – e.g. banana, sweet potato and Fiji taro – turns out to be roughly the same as the price of imported rice. Rice is widely consumed because of its properties – preparation and cooking time, ease of storage and consumption, and minimal waste. It is a good example of Venuatu's access to and growing reliance on the modern world.

The most expensive products are not even the newest or most exotic, but rather those belonging to the traditional heritage. In ceremonial exchanges, the customary offerings are foods that have symbolic value, such as large yams and taro. These items carry high prestige, and it is common to see a yam selling for the price of several sacks of rice.

Through buying and selling, people build associations. The market is also the place where social relationships are created and sustained, and where an individual's identity and personality may emerge.

Selling at market is a pleasant way of earning money. The women vendors enjoy relative freedom in their families and autonomy in their agricultural work. The gardens generate independent food supplies and cash for the family. Meanwhile, women fulfil the responsibilities of motherhood, as their children can remain with them. Their trips to market bring added benefits without extra costs. There they buy fresh products (meat and bread) and manufactured goods (rice, sugar and tinned food) – and visit friends. By choosing the days they go to town, women enrich their personal and social lives.

Raising crops for specifically for sale – e.g. peanuts, ginger and certain yams such as *C. rotundata* – may require large and numerous gardens. Intensive or long-term cultivation can lead to environmental harm, including deforestation and soil degradation.

In general, merchandise sells well, depending on what is available. On many days, however, there are not enough customers – urban residents who rely on the market, partially or entirely – to absorb the ever-growing supply. Vendors sometimes must sell off their merchandise at the Vila market. This takes time and money, depressing income and

the spirit of enterprise. It also encourages relocation – even if temporary – into the towns.

One cause of the surplus supply may be the gardens themselves. Virtually every family has, rents or shares a small plot, whether in town, in the surrounding regions or in their villages of origin. As the parcels are small, the risk of theft high, and free time limited, the gardeners'goal is to reduce the amount of fresh produce they must purchase, by producing a small reserve for the family. When these town gardens yield a seasonal surplus, it is turned into prepared dishes (lap-lap) and sold to neighbours or exchanged with close friends, but rarely taken to market.

3.2 THE GARDENS

The urban centres have the peculiar feature of being surrounded by gardens. These are the resident's parcels, cultivated for self-sufficiency, not the market gardens whose purpose is to supply the town. While it is legally possible to buy land for private use in the urban area, its scarcity and high price mean that it would be very rare to use it for gardening. So, families plant vegetable gardens on municipally-owned land that is inhabited or zoned for habitation, or on family property and plantations around the edges of town.

In order to identify the types of gardens in Luganville, classify the plants, and understand the nature and timing of the work, a study of 40 people from 9 islands who live in various parts of town, along with 10 families from the Mango neighbourhood, has been conducted.

It is possible to derive four distinct types of gardens, according to the mixture and organisation of vegetation:

- Pleasure gardens – composed of flowers, small food plants and fruit trees surrounding the houses.
- Intra-urban food gardens – adjacent to or close to the houses, with a great variety of fruits and vegetables. Of diverse sizes and layouts, ranging from neatly organised vegetable plots to traditional food gardens, these are planted in unoccupied areas of the neighbourhoods. They are called 'old' gardens, as the soil has lost fertility through use as permanent 'larders.' Natural toilets, animal enclosures for chickens and pigs, and compost destined for fertiliser often occupy the same plots.
- Inter-urban gardens – encircling the town, on land that is cleared progressively from the secondary forest and left fallow every four or five years. These 'new' gardens consist largely of fruit trees. Access is freely granted by landowners, by fixed individual agreements. As elsewhere in Vanuatu, families may use the fruit but may not make any commercial profit from it.
- Extra-urban gardens – located on rented land near other villages on Santo. More numerous and typically larger, they often feature a wider range of crops. Due to

the distance from town, gardeners usually work only on weekends, arriving by car with family and friends to help, and bringing back provisions for the week. These consist mainly of staple foods – e.g. taro, yam, sweet potato and banana – that are eaten in great quantities and are easily transported and stored. More perishable and fragile food – e.g. cabbage and papaya – are raised in other gardens or bought on the market.

Boundaries are essential in order to allocate and divide the land. In the countryside, these are more difficult to identify than in town, where roads, houses, fences, Polyscias hedges or banana trees provide clear markers.

In Mango, 30 parcels of 900m^2, located within and alongside the neighbourhood, provide an arable terrain of 4 hectares. The 26 families each have 3 to 10 gardens. Sometimes a cultivated parcel contains the garden plots of several members of one family. The newest residents often have little choice, the only available spaces lying near the centre – old landfills for household and construction waste – or in marshlands along the river. The range of food crops, and the number of species and variants in these town gardens depend on how long the land has been occupied and its current condition.

Analysis of the most-often cultivated fruits and vegetables (Figure 6) reveals several phenomena:

- they all produce tubers and rhizomes;
- there are about the same number of endemic plants and trees as species introduced or imported from elsewhere;
- vegetable and fruit species occur in equal numbers, but vegetables are more likely than fruits to be from ‘introduced’ species; and,
- local products (taro, yam, kava, breadfruit and nut trees) are cultivated in the greatest numbers.

Note should be taken of two observations – the small proportion of ‘water’taro, due to the lack of irrigation systems and poor soil adaptation, and the concentration of fruit trees in house gardens, due to their long growing time and lack of clear ownership in other gardens.

These miniature urban farms provide a significant portion of the daily diet. Their productivity depends on the season, size of parcel, and the family (number of people, time available, length of residency, etc.).

With migration, connections within and between the islands have become commonplace. The mentality of people, and the nature of their gardens, have been shaped by the contact.

Food plants	*Scientific name*	Food trees	*Scientific name*	Non-food plants/trees	*Scientific name*
Garlic	*Alium sativus*	Breadfruit	*Atrocarpus spp.*	Bougainvillea	*Bougainvillae sp.*
Pineapple	*Ananas sativus*	Avocado	*Persea americana*	Bagnant	*Ficus spp.*
"Island" cabbage	*Abelmoschus manihot*	Cocoa	*Theobroma cacao*	Burao	*Hibiscus tiliaceus*
Peanut	*Arachis hypogea*	Wild cherry	*Muntingia calabura*	Cotton	*Gossypium spp.*
Bamboo	*Bambusa*	Lemon	*Citrus spp.*	Croton	*Codiaeum variegatum*
Banana	*Musa spp.*	Bullock's heart	*Annona reticulata*	Cohue	*Intsia bijuga*
Bottle gourd	*Lagenaria siceraria*	Coconut palm	*Cocos nucifera*	Filao	*Casuarina equisetifolia*
Sugar cane	*Saccharium officinale*	Sour sop	*Annona muricata*	Flamboyant	*Delonix regia*
Carrot	*Daucus carota*	Guava	*Psidium guayava*	Tree fern	*Cyathéa spp.*
Cabbage	*Brassica oleracea*	Jackfruit	*Artorcarpus heterophyllus*	Frangipani	*Plumeria acuminata*
Chocho	*Sechium edule*	Java plum	*Eugenia jambosa*	Glue	*Pisonia umbellifera*
Citronella	*Patricum maximum*	Lime	*Citrus aurantium*	Hibiscus	*Hibiscus rosa-sinensis*
Cucumber	*Cucumis sativus*	Mandarin	*Citrus nobilis*	Kapok	*Ceiba pentandra*
Snake gourd	*Trichosanthes cucumerina*	Mango	*Mangifera indica*	Kassis	*Leucaena leucocephala*
Watercress	*Nasturtium officinale*	Morinde	*Morinda citrifolia*	Kauri	*Agathis macrophylla*
Raspberry	*Rubus neoebudicus*	Naduldule	*Burckella obovota*	Kava	*Piper methysticum*
Passion fruit	*Passiflora edulis*	Malay apple (Nagarika)	*Syzygium malaccense*	Wild kava	*Macropiper latifolium*
Ginger	*Zingiber zerumbet*	Nakatambol	*Dracotomelon vitiense*	Liana US	*Mikana micrantha*
Green Bean	*Phaseolus vulgaris*	Namambe	*Inocarpus edulis*	Melektree	*Antiaris toxicaria*
Yam	*Dioscorea sp.*	Nandao	*Pometia pinnata*	Mimosa	*Schleinitzia insularium*
Wild yam	*Dioscoreacées*	Nangaille	*Canarium indicum*	Nakoka	*Bishovia javanika*
Sweet potato	*Ipomoea batatas*	Ambaretta (Naous)	*Spondias cythera*	Namalaos	*Garuga floribunda*
Corn	*Zea mays L.*	Natapoa	*Terminalis catappa*	Namatal	*Kleinhovia hospita*
Manioc (cassava)	*Manihot spp.*	Navele	*Barringtonia spp.*	Namele	*Cycas circinnalis*
Naviso	*Saccarium edule*	Orange	*Citrus sinensis*	Nangalat	*Dendrocnide spp.*
Onion	*Allium tuberrorum*	Grapefruit	*Citrus grandis/paradisis*	Nantangora	*Metroxylon warburgii*
Papaya (paw paw)	*Carica papaya*	Sweet sop	*Annona*	Narara	*Spathodea campanulata*
Watermelon	*Citrullus vulgaris*	Sterculia	*Sterculia tannaense*	Natora	*Intsia bijuga*
Chili	*Capsicum spp.*	Tamarind	*Tamaridus indica*	Navenu	*Macaranga dioica*
Pepper	*Capsicum frutescens*			Orchid	*Orchidaceae*
Pumpkin	*Curcubita spp.*			Palm	*Veitchia sp.*
Lettuce	*Lactuca spp.*			Pandanus	*Pandanus tectorius*
Snake bean	*Entada pursaeta*			Pangi	*Pangium edule*
"Water" taro	*Colocasia esculenta*			"Parapluie des îles"	*Licuala grandis*
Fiji taro	*Xanthosoma sagittifolium*			"Pin colonaire"	*Araucaria ostusa*
Tomato	*Solanum lycopersicum*			Polyscias	*Polyscias spp.*
White bone	*Brassica sp.*			Rosewood	*Thespesia populnae*
Vanilla	*Vanilla plantifolia*			Sandalwood	*Santalum austrocaledonium*
				Wild taro	*Alocaria macrorhyza*
				White wood	*Endospermum medullosum*

Figure 6: Inventory of the principal plant species found in Mango gardens

The diversity of Vanuatu, both natural and cultural, is readily visible in the species of plants growing in town. When people move to an unfamiliar place, they carry along part of their culture, environment, goals and habits – part of themselves. Unable to bring the land, they bring seeds. Once planted and growing, the seeds recreate connections with 'home.' Every day, the identity of their village or island is affirmed through the uniqueness, rarity or reputation of its species. Their originality gives distinction. At the same time, their diversity leads to curiosity about – and the possibility of exchanging species with others. New variants, once tended and flourishing, bring added prestige to the garden, and hence to its owner. Just as the town serves as the point of encounter and

new connections for migrants, the gardens concentrate plants from all over the archipelago into a microcosm of the country.

The natural environment surrounding the town provides a rich source of other products: plants, wild fruits and nuts, game – flying fox, wild pig, green pigeons, etc. – crustaceans, fish, and more. If this natural storehouse is to survive, the management of natural resources must account for and adapt to urban growth.

3.3 SHOPS

Luganville has a well-established distribution network for finished and manufactured goods. There are more than one hundred breeders, food processors and distributors – dealing in poultry, fish, corned beef, biscuits, bread, beverages, butchering, packaging and retailing. The shops belong to Chinese merchants who import virtually everything, then redistribute it by boat to other islands and to wholesalers in the villages. There families can find anything they need – food, cleaning products, clothing, garden tools, etc.

Dependence on manufactured products is growing in both urban and rural areas. For example, an average household spends 30% of its income on rice and bread, but only 7% on tubers.[18] Urban inhabitants, whether temporary or permanent, use their salaries to buy merchandise or to send it by boat or aeroplane to their families remaining behind in the villages. Vendors spend profits from market sales on indispensable products such as oil, salt, sugar, petrol and matches, which they often carry home. Trading is thus established, with fresh produce from the villages being exchanged for merchandise from the town.

People are attracted to new foods because of their novelty, price, taste, convenience, and conservation, but they gradually become dependent on the products and the associated lifestyle. Time and space take on new meanings, which affect socio-economic patterns, which in turn create changes in diet. Expenditures on food represent a large portion of the family budget, depending on location and other factors – professions of the husband and wife, number of children, visiting family members, etc.

Diversity of food supply and easy access do not necessarily lead to a more balanced diet. Thus, the inhabitants of Luganville rarely sell the produce of their gardens. For example, all the food produced in Mango is consumed by the families. Obviously, they grow less than people in rural areas, and they have other sources of income. The reverse is true in many villages, where a large part of the produce is sold in town.

If, as shown, there is high consistency in the availability and selection of food, including rice, bread, sugar and tinned goods, the question must be asked: has diet improved or become more balanced ?

3.4 OTHER DISTRIBUTORS

The town now offers modern ways to eat – restaurants, 'kava bars,' stalls and caterers selling prepared dishes. The menu, ingredients, cooking methods and prices vary along with the type of establishment: lap-lap, plates of meat with sauce, grilled fish garnished with rice, sausages and fries, or spring rolls and Chinese noodles. In Luganville, cuisine transcends distance and frontiers. One can discover the modern world by letting the senses travel.

Prepared dishes have appeared in response to the demand of a transient clientele – vendors, tourists, immigrants – and working people. They are another facet of the changing notions of time and place in urban life. Available throughout the day, and sometimes late into the evening, people find the ready substitute for family cooking. In the evening, working women prefer to buy plates of lap-lap with grilled fish and bread as side dishes. Their financial autonomy gives them buying power. Thus, they can shift their time 'budget' from cooking to family life or gardening.

4. THE RELATIONSHIP BETWEEN TOWN AND COUNTRY

Natural resources are ubiquitous in daily life and work: nature is the backbone of the culture. Given that the majority of the population is rural, it is important to manage these resources and their use. Tension arises from the fact that the environment offers the only source of cash income – farming, logging, fishing, tourism, etc. Thus, it is essential that people and communities become aware of the fragility of their ecosystem, and the risks of exploiting it.

4.1 TRANSPORTATION

The eighty-plus islands of the archipelago are physically scattered and widely different from one another. With 3,200 settlements (of which 53% have less than fifty people), the country is inevitably confronted with transportation problems, even most of the islands are linked by sea or air. Government services – health and education, for example – and economic development are constrained by distance, open sea, rivers, forests, volcanoes and other geographic obstacles. On Santo, there are a few asphalt roads that enable communication with the villages on the southern and eastern coasts. Other areas remain difficult to reach. Road building is still equated with access to the modern world, which is much desired.

4.2 CASH CROPS (COMMERCIAL FARMING)

The introduction of cash crops came as a direct result of colonisation. Large plantations of copra, cocoa and coffee formed the basis of the country's economy. Since independence, however, the complex system of land ownership has led to conflict with traditional landholders, creating distrust on the part of foreign investors. Regardless, agricultural production is developing, and new plantations of kava, squash, pepper vanilla, vegetables and other crops provide employment and income for urban and rural farmers.

Over the past 15 years, the combined economic contribution of agriculture, forestry and fishing has declined, due to unstable international markets, lower copra prices, disorganised plantations, cyclones and other forces. Nearly 80% of the country's agricultural output comes from small farms. If women manage the market gardens, men control the cultivation and sale of single cash crops. In fact, the increase of income from the selling kava on national and international markets has tempted certain islands to abandon food gardens in favour of farms that e dedicated this future 'national plant.' The trend toward monoculture of kava (or any other crop, such as citrus fruits, ginger or vanilla) will ultimately cause upheavals in land use, diet, economic development and social dynamics of the villages.

4.3 FORESTRY

According to the National Forest Inventory (NFI) of 1991[19], 36% of the country was covered in forest – 9.35 million m3 on Santo, with nearly two million usable by the wood industry. In 1994, the government set logging quotas totalling 300.000 cubic metres per year, in apparent ignorance of the destruction that would result in just a few years. In 1996, forestry represented 13% of the total value of exports from Vanuatu. The State and some villages authorised a massive cutting of the forests, leaving no more than 100 km^2. The impact of this exploitation will be dramatic if the designated quotas remain in force (Figure 7). On Santo and Malo, for example, the forest resources will approach extinction in 14 years.

Fortunately, a legal code governing logging in Vanuatu [20]has just been enacted. The Conservation section of the Department of Forests clearly aims to protect forest areas and their resources – especially those that are culturally, biologically and socially specific – for future generations.

Island	*Commercial volume (m^3)*	*Quota/yr (m^3)*	*Estimated lifetime*
Santo/Malo	1.197.000	85.000	14
Malekula	328	35.000	10
Efate	271	31.500	9
Erromango	302	55.000	6

Figure 7: Example of the impact of logging on the forests of four islands

4.4 TOURISM

Due to its isolation, the archipelago has been slow to develop its potential as a destination for tourists. Thus, it is very attractive to those who dream of exotic journeys to unspoiled places. Paradoxically, the State and local communities see this pristine environment as a source of revenue and employment from the construction and operation of tourist facilities. These opportunities, profitable and easy to exploit in the short-term, require long-term management and a well-coordinated programme whose goal is to preserve the integrity of the natural and cultural heritage.

Despite the significant advantages that this country already offers – an international airport, warm hospitality, security, varied landscapes, etc. – inadequate management and sustainable development cast doubt on the very future of tourism. Clients will arrive expecting exotic and 'postcard-perfect' scenery. If they instead encounter polluted lagoons, beaches and air, unsanitary conditions, crime, few roads and poor transportation, they will go elsewhere. It is vital for the economy, therefore, that Vanuatu create a true 'culture of tourism' with guaranteed practical protection for its valuable and profitable resource. Requiring hotels to conform to specific standards – ISO 14001, for example – would assure the local population and tourists of a balance between the modern and the traditional. The future of the inhabitants, the tourist trade, the economy and thus, the country itself is at stake.

5. CONCLUSION

As evidenced, the Vanuatuan diet is changing. The role of rural agriculture may also be in the midst of transition, progressively becoming the town's 'pantry.'

Increased use of natural resources, population growth and industrial development are leaving the ecosystem fragile and exposed. In rural and urban areas, resources absolutely must be regulated. Burgeoning towns must find alternative ways to meet their needs, so as to limit damage to the economic, psychological and social ecology of the archipelago. Laws that integrate traditional values and modern imperatives would emphasise the value of biodiversity and bring sustainable management to the forests and environment.

Each island possesses a unique culture and character, of which the inhabitants are rightfully proud. Vanuatu remains one of the last places on Earth where it is not too late to preserve this precious national heritage. At stake is the future of a country struggling to reconcile its diverse traditions with the pressure toward uniformity of the modern world.

ENDNOTES

1 See Chapter 4: "Du village à la ville" in: Rapport intermédiaire du programme "Se Nourrir à Santo" : Forêts insulaires, p. 113.

2 The Tonkinese arrived in 1939 as contract labourers for the French plantations. Some 1,200 of them left in 1963 for Indochina, but those who remained have been integrated gradually into the economic life of the island.

3 Composed of 96% Vanuatuans and 4% European, Asian and other Pacific ethnic groups that are concentrated in the two towns.

4 Haberkorn, G., Vila: Transit Station or Final Stop? Canberra: A.N.U, 1989.

5 Vanuatu National Population Census. Vila: Statistics Office, May 1989, pp. 74-75.

6 The birthrate is falling, from 3.2 in 1979 to 2.8 in 1989.

7 See the forthcoming final report by ORSTOM/APFT: Du village à la ville: Réaménagement de l'espace et du temps par une société urbaine. Le cas de Mango, quartier du Luganville (Santo – Vanuatu)".

8 Since independence in 1980, land can no longer be purchased in Venuatu, only rented on 75-year long-term leases.

9 Vanuatu National Agricultural Census: Main Report. Vila: Statistics Office, 1993.

10 Plan National pour l'Environnement: Projet, Programme régional Océanien de l'Environnement. Vanuatu, Austrailian Office for International Development Aid for Nature Conservation, 1993.

11 Sustainable Human Development in Vanuatu: Moving on Together. Vila: UNICEF, 1994.

12 Vanuatu National Agricultural Census. Vila, 1993, p. 135.

13 In the French text the author explains using the word 'vendeuse'– the feminine form of vendor – because 90% of the vendors are women. N.D.T.

14 Fanafo is the village that traditionally is the biggest supplier to the market. It has been the subject of additional studies for the thematic reports.

15 Limited to seeds sold in stores. Other vegetable and animal products are subject to strict quarantine laws on all the islands.

16 Only 28% of Santo's land is currently under cultivation.

17 Certain tubers, due to their size, variety or other traits, are used for ceremonial exchanges (marriage, death, etc.)

18 A Situational Analysis of Children and Women in Vanuatu. Vila: UNICEF/Vanuatu Government, 1991, p. 71.

19 Ibid. p. 86.

20 Thistlethwaite, R.J., Forest Sector Study and Implications on Forest Policy. Vila: FAO, 1996.

CHAPTER 3

TRADE AND THE TRANSFORMATION OF FOOD SECURITY STRATEGIES ON MALO ISLAND, VANUATU

Matthew G. ALLEN[1]

INTRODUCTION

Located off the southern end of Santo Island, Malo occupies an area of approximately 180 km. Geologically, Malo is a young island, characterised by a raised coral limestone plateau, which was uplifted during the Quaternary period; and a low-lying limestone littoral fringe, which was produced during the Holocene period (Quantin 1982: Geology Map). The plateau occupies most of the surface area of the island, and is covered by humic and weakly desaturated ferrallitic soils of good fertility (Quantin 1982: Soil Map). Generally speaking, subsistence agriculture is conducted on the plateau; whilst cash cropping, particularly coconut cultivation, is carried out on the littoral fringe.

In 1997 the population of Malo was about 3.450 persons (Statistics Office 1991, n.d.). The average annual rate of population growth on Malo between 1967 and 1989 was 2,75 percent (McArthur and Yaxley 1967; Statistics Office 1991). A large proportion of Malo's population live in villages on the west and south west coasts of the island[2].

Although the economy of Malo still has its basis in subsistence agriculture, a significant modern trading sector has also emerged.[3] This has been facilitated by Malo's close proximity to an urban centre; Vanuatu's second town', Luganville. Almost all of Malo's external trade is conducted with this town: copra, cocoa, and fresh fruits and vegetables are exported to Luganville; and various products, a large proportion of which are 'store-purchased'food products such as rice, flour and tinned fish, are imported from Luganville to Malo.

The emergence of a cash-based trading economy on Malo has been accompanied by much agricultural and social change (see Allen [thesis, in preparation] for an in depth discussion of these changes). However, this paper focuses on one objective of agriculture on Malo which has, in a way, remained largely unchanged; the quest for food security in general, and for a consistent annual supply of food in particular. In the past this was achieved through the cultivation of a large diversity of cultivars of the main staple crops yam and breadfruit; and, in the case of the latter crop, through the use of preservation and storage techniques which extended its availability well beyond its normal fruiting season. Today, food security is achieved through the wide spread cultivation of Fiji taro, which is effectively a perennial food crop; and through the consumption of imported foods, which currently account for about 20 percent of Malo peoples' daily energy consumption.

Thus it can be seen that whilst the *objective* of food security has remained constant, the methods adopted to achieve it have changed over time. Opportunities which have arisen over the past 100 years or so have enabled the Maloese to break their dependence upon a few seasonal food crops, and establish a food supply system in which the annual supply of food is not only more consistent, but also more resilient to environmental variability.

1. SUBSISTENCE AGRICULTURE

Subsistence agriculture on Malo has three main components: the shifting cultivation of food gardens[4], arboriculture and animal husbandry. Of these, the shifting cultivation of food gardens is the most important in terms of over-all food production. A wide variety of food crops are cultivated in gardens, of which the staple crops are (in order of importance): yam (seven species of *Dioscorea* in total of which *D. alata* and *D. nummularia* are the most significant), Fiji taro *(Xanthosoma sagittifolium)*, banana *(Musa spp.)*, cassava *(Manihot esculenta)* and sweet potato *(Ipomoea batatas)*. Island cabbage *(Abelmoschus manihot)* is the main leafy green vegetable.

People on Malo classify gardens into two main types, depending upon which species of yam dominates in the first year planting. *Alolona* gardens contain mostly *Dioscorea alata*, whilst *seremalavo* gardens are reserved for a particular group of cultivars of *Dioscorea nummularia* known locally as marou. The cultivation of *alolona* gardens dominates shifting cultivation in both east and west Malo. These gardens are cropped for between two and five years; in the first year they are basically *D. alata* yam gardens, although they do contain quite high densities of Fiji taro, banana, cassava, sweet potato and other yam species. After the yams are harvested, approximately 50 per cent of the planting sites are replanted with Fiji taro and banana, which continue to produce for up to four years. *Seremalavo* gardens are not replanted after the yam harvest, and they are generally abandoned after the second year of production. Fallow lengths for both *alolona* and *seremalavo* gardens average between 15 and 20 years in west Malo, and about 35 years in east Malo.

Yield estimates were made for four species of yams, Fiji taro and banana (Table 1-see appendix). (For an in-depth discussion of the methodology and results of these yield surveys see Allen [thesis, in preparation]). It can be seen that Fiji taro is the most important food crop in west Malo, where as *marou* yams are the most important food crop in east Malo. The other three yam species are the second most important food crops in both east and west Malo. Note that *D. alata* contributes about 72 percent of the overall yield of these three yam species in west Malo, and about 65 percent in east Malo. The net production of these staple crops is equivalent to 2,1 kilograms and 2.278 kilocalories per person per day in west Malo, and 2,5 kilograms and 2.667 kilocalories per person per day in east Malo.

2. TRADE BETWEEN MALO AND LUGANVILLE

A survey of the volume and composition of trade between Malo and Santo was made possible by the fact that a beach on south Santo (which is known as Naonepan) is a bottle neck in the movements of goods and people between the two islands[5]. The survey, which was conducted on two consecutive days a week for a period of 27 weeks between June and December 1997, focused specifically on the export (from Malo) of products intended for sale at the market in Luganville, and on the import (to Malo) of 'store-purchased' food items such as rice, flour, tinned fish and sugar.

Malo's monetary economy is, with three exceptions, dependent upon the export and sale of products to Luganville. The exceptions to this are remittances, wages paid from sources external to Malo (such as those paid to teachers and other government employees), and the sale of a very small amount of fresh produce at the market in Vila (see Greindl 1999: 30, 38). Estimates were made of the volume and value of exports of the three most important components of the Malo cash economy: copra, cocoa, and the sale of fresh fruits and vegetables, and other products, at the market in Luganville (Table 2- see appendix).

It can be seen from Table 2 that copra is clearly the most important export commodity for Malo, as it is for Vanuatu as a whole (DAH 1996: 2; Statistics Office 1997: 6). In comparison to copra, cocoa is a relatively insignificant export commodity for Malo. The importance of cocoa has, however,been increasing over the past 20 years or so.

Although the income earned from the sale of goods at the market in Luganville is relatively small, most of this income flows to women (the vast majority of market vendors are women), and in this manner the market helps to redress a gender bias in the distribution of income that exists on Malo[6].

The Naonepan survey sampled 50 different marketed products, which are listed in Table 3[7] (see appendix) However, due to the seasonality of many of the products which are sold at the market, particularly fruits and nuts, these tables are by no means representative of the entire range of products which are marketed by vendors from Malo over the course of a full year. Griendl (1997: 138-140, Figures 27-29) provides exhaustive lists of the products sold at the Luganville market, and it seems likely that most of these products, with the important exceptions of kava and Colocasia taro, have been sold at some stage in the past by vendors from Malo[8].

It can be seen from Table 3 that *marou* yams were clearly the most important product marketed in both in terms of quantity and value, accounting for approximately 21 percent of the total value of products sold.[9] Furthermore, the six most important marketed products in terms of value (which were, in order of importance: *marou* yams, green coconuts, ripe bananas, 'wild' yams, Fiji taro and lap-lap bananas) are all

significant food crops on Malo.

The Naonepan survey sampled 26 ‘store-purchased’ food products which were imported to Malo during the sample period (Table 4 - see appendix). (Note that the figures in Table 4 have been extrapolated up from 27 weeks to one year, in order that they can be discussed in relation to the subsistence agriculture and income data which have been already presented). Of these products, rice is clearly the most important, accounting for approximately 65 percent of the total quantity of food imported. In a nutritional sense, these products are collectively equivalent to about 538 kilocalories per person per day.

3. THE TRANSFORMATION OF FOOD SECURITY STRATEGIES

The discussion thus far has focused on the contemporary subsistence and monetary economies of Malo, and the data presented now allows for a description of the present day food supply situation on the island. It has been seen that the net production of the main staple crops cultivated on Malo is equivalent to 2,1 kilograms and 2.278 kilocalories per person per day in west Malo, and 2,5 kilograms and 2.667 kilocalories per person per day in east Malo (Table 1 - see appendix); while store purchased imported food products provide about 538 kilocalories per person per day on Malo as a whole (Table 4 - see appendix).

According to the Food and Agriculture Organisation (FAO) in conjunction with the World Health Organisation (WHO), "moderately active" adults require approximately 2.600 kilocalories of food energy per day (WHO 1979: 29). We can assume that all of the ‘store-purchased’ foods imported to Malo are actually consumed, an assumption which can not be made for subsistence production (for reasons already discussed), which means that about 20 percent of Malo people’s daily energy requirements are coming from imported foods, and the rest are coming from subsistence production.

People on Malo claim to consume imported foods for a variety of reasons: they are quick and easy to prepare (particularly in comparison with local staple foods) and they can be stored for a long time. People also enjoy the taste of imported foods, claiming that they become accustomed to eating them from early childhood. However, perhaps more importantly, imported foods are always available to be purchased and consumed, or in other words, they are non-seasonal in nature. In this manner, they provide an underlying consistency to the annual supply food; a consistency which did not exist in the past, at least not to the same extent.

Furthermore, in a region which is frequently subject to cyclones and occasionally subject to droughts, the ability to produce cash crops and consume imported foods provides an important ‘safety net’in the event that subsistence production fails. Note that

coconuts are generally more resilient to environmental variability (particularly droughts) than are the staple food crops which are produced on Malo.

All available evidence suggests that in the pre-contact period breadfruit and 'strong' and 'wild' yams *(D. nummularia)* filled the annual shortage in the supply of 'traditional' yams *(D. alata)* on Malo. *D. alata* yams were (and still are) available between March and September; with the latter month roughly coinciding with the commencement of the *D. nummularia* harvest, which continued until late December/early January. Breadfruit then became the staple crop, and with the use of the preservation and storage techniques, its availability was extended until the commencement of the next year's *D. alata* harvest.

Thus, it could be said that prior to European contact, people on Malo were using the resources which were available to them as best they could in order to pursue the objective of a consistent annual supply of food. The adoption of Fiji taro (and, to a lesser extent, cassava), which probably occurred some time towards the end of the 19th century, can be easily interpreted as a continuation of this strategy. According to Bourke (writing with regard to agricultural change in Papua New Guinea): "*Xanthosoma* taro and cassava mature later than most other energy crops. More importantly they can be stored in the ground after maturity until they are needed, giving flexibility and security by filling in gaps in the food supply" (1990: 152).

Indeed, the adoption of *Xanthosoma* coupled with increased consumption of imported food (and the associated improvement in food security) is probably largely responsible for the decline in the importance of breadfruit on Malo.

CONCLUSION

The data and brief discussion presented here tell only a small part of the story of agricultural, social, economic and environmental change which have occurred on Malo over the past one hundred years or so. The paper has focused specifically on the changes in food security strategies which have occurred firstly due to the adoption of New World crops, particularly Fiji taro; and more recently due to trading opportunities which have arisen as a result of colonisation in general, and Malo's close proximity to an urban centre in particular[10]. The widespread cultivation of Fiji taro and the high levels of imported food consumption have transformed the food supply and security situation on Malo. People on Malo today are no longer entirely dependent on the cultivation of a handful of annual food crops; and the ability to consume imported foods has fortified the contemporary food supply system against environmental variability. More generally, people on Malo have demonstrated themselves to be competent resource managers and innovators, who have developed and continue to develop a successful 'mixed' economy which operates independently of external economic assistance.

APPENDIX: TABLES

Table 1: Production estimates of the three most important food crops on Malo (kg per person and per adult equivalent per year)1

	West Malo		*East Malo*	
Crop(s)	*Production per person (kg/year)*	*Production per adult equivalent (kg/year)*	*Production per person (kg/year)*	*Production per adult equivalent (kg/year)*
Alolona yams (D. alata, D. rotundata and D. esculenta)	421,6	505,8	422,2	482,3
Marou yams (D. nummularia)	20,7	26	469,1	500,7
Fiji taro	516,9	622,7	227,8	246,6
Banana	193,0	231,6	318,5	356,5
Total gross production of starchy staple crops	1152,2	1386,1	1437,6	1586,1
Total net production (ie taking account of planting material and edible portions)	**763,8**	**919**	**904,9**	**998**

Note:

1. To calculate adult equivalency, children aged between two and 12 were counted as half adults, whilst anybody over the age of 12 was counted as an adult.

Table 2: Estimates of income on Malo in 1997

Source of income	*Estimated volume of sales (where relevant) (tonnes)*	*Estimated revenue (Vatu)*	*Estimated revenue per person (Vatu)*	*Estimated revenue per person (Aus $)*
Copra	2.150[1]	70.986.550	20.576	242
Cocoa	132,4[2]	13.712.750	3.975	47
Market	169,2	10.151.874	2.943	35
Wages (external)	N/A	Small[3]	Small	Small
Remittances	N/A	Small[3]	Small	Small
Minor cash crops (Vanilla, pepper, chilli)	Negligible	Negligible	Negligible	Negligible
Total			**27.494**	**323**

Notes:

1. ***Almost all copra produced was Grade One. 41 percent was produced by plantations; 59 percent was produced by smallholders. 28 percent of plantation production was sold directly to the VCMB in Luganville; 72 percent was sold to the two official VCMB agents on Malo. With regard to smallholder production: 19 percent was sold to the VCMB in Luganville; 47 percent was sold to VCMB agents on Malo; 30 percent was sold to traders on Malo; and 4 percent was sold to cooperatives.***
2. ***69 percent Grade One; 28 percent Grade Two; three percent Grade Three. 40 percent was sold directly to the VCMB in Luganville; 60 percent was sold to traders on Malo.***
3. ***The income earned from wages and remittances is unknown but is thought to be small compared with the income earned from the sale of copra, cocoa and fresh food at the Luganville market.***

Table 3: Quantity and value of products offered for sale, and actually sold, by vendors from Malo at the Luganville market between June and December 1997 (Vatu and Australian Dollars)

Product	*Quantity marketed (kg)*[1]	*Total sold (kg)*	*Price per kilo or per item (Vatu)*[2]	*Value of produce offered for sale (Vatu)*	*Value of produce offered for sale (Aus $)*	*Value of produce sold (Vatu)*	*Value of produce sold (Aus $)*
'Marou'	20.080	17.022	64	1.285.120	15.120	1.089.408	12.817
Green coconuts†	16.897	13.851	26	439.322	5.169	360.126	4.237
Ripe bananas	8.274	5.824	56	463.344	5.451	326.144	3.837
Wild yam	3.718	3.160	86	319.748	3.762	271.760	3.197
Fiji taro	7.909	3.391	80	632.720	7.444	271.280	3.192
Lap lap bananas	9.075	7.534	36	326.700	3.844	271.224	3.191
Tomato†	2.741	2.699	99	271.359	3.193	267.201	3.144
Island cabbage	1.508	1.364	171	257.868	3.034	233.244	2.744
Nakatambol	4.307	4.145	52	223.964	2.635	215.540	2.536
Paw paw	2.333	2.207	84	195.972	2.306	185.388	2.181
Pineapple	3.185	1.914	93	296.205	3.485	178.002	2.094
Cucumber†	3.599	3.284	53	190.747	2.244	174.052	2.048
Greater yam	3.834	3.125	51	195.534	2.300	159.375	1.875
Chickens	226	225	600	135.600	1.595	135.000	1.588
Orange	2.117	2.115	54	114.318	1.345	114.210	1.344
Pomelo	4.343	3.109	35	152.005	1.788	108.815	1.280
Green bananas	1.882	1.095	99	186.318	2.192	108.405	1.275
*Mats**	199	156	650	129.350	1.522	101.400	1.193
Mandarin	1.567	1.566	54	84.618	996	84.564	995
White bone cabbage†	1.155	1.083	63	72.765	856	68.229	803
*Cooked fish**	774	774	75	58.050	683	58.050	683
Pumpkin	2.277	1.698	27	61.479	723	45.846	539
'Wailu'(D. rotundata)	764	666	62	47.368	557	41.292	486
Bottle gourd	7.479	632	63	471.177	5.543	39.816	468
Dry coconuts†	1.326	1.224	28	37.128	437	34.272	403
Golden apple	488	473	71	34.648	408	33.583	395
Capsicum	324	324	100	32.400	381	32.400	381
Shallots	304	273	95	28.880	340	25.935	305
'Afrika'(D. trifida)	876	538	48	42.048	495	25.824	304
Sour sop	534	475	47	25.098	295	22.325	263
*Fire wood**	104	104	200	20.800	245	20.800	245
Common bean	152	143	138	20.976	247	19.734	232
Snake bean	399	328	57	22.743	268	18.696	220
Galip nut	608	604	27	16.416	193	16.308	192
*Baskets**	111	81	200	22.200	261	16.200	191
Malay apple	319	319	50	15.950	188	15.950	188
Lemon	219	219	72	15.768	186	15.768	186
Lesser yam	203	203	62	12.586	148	12.586	148
Choko†	200	200	50	10.000	118	10.000	118
Polynesian chestnut	173	173	52	8.996	106	8.996	106
Sweet potato	437	437	20	8.740	103	8.740	103
Lettuce	66	66	111	7.326	86	7.326	86
Corn	106	105	45	4.770	56	4.725	56
Navele (Barringtonia spp.)	118	118	27	3.186	38	3.186	38
Chilli	47	46	66	3.102	37	3.036	36
Water cress	43	30	86	3.698	44	2.580	30

Ginger	27	23	66	1.782	21	1.518	18
Yard bean	14	13	107	1.498	18	1.391	16
Carrotts	23	22	58	1.334	16	1.276	15
Bullock's heart	7	7	70	490	6	490	6
Total (27 weeks)	**116.057**		**87.845**	**7.014.214**	**82.528**	**5.272.016**	**62.028**
Average per week	**4.298**		**3.254**	**259.786**	**3.057**	**195.260**	**2.297**
Total per year	**223.496**		**169.208**	**13.508.857**	**158.943**	**10.153.512**	**119.461**

Notes:

1. ***Quantity is given in kilograms, except for the products marked with an asterix, which are listed in numeric quantity.***
2. ***For most products I have used my own price per kilogram estimates. However for some products I have had to use Greindl's 1996 estimates. The latter products are marked with a † symbol.***

Table 4: Estimates of the quantity of 'store purchased' food products imported to Malo in 1997 (based on an extrapolation of data collected on Naonepan beach between June and December 1997) (kilograms)

Product	*Quantity imported per year (kg)* [1]	*Price (Vatu per kilo)* [2]	*Value imported per year (Vatu)*	*Energy content (kilocalories) per person per day*
Rice	123.948	105	13.014.540	360
Flour	27.106	100	2.710.600	80
Sugar	17.591	125	2.198.875	49
Tinned Fish	4.789	482	2.308.298	6
Tinned Meat	3.944	730	2.879.120	8
Salt	3.599	128	460.672	0
Bread	2.848	180	512.640	7
Cooking oil	2.504	594	1.487.376	18
Wine	1.659	750	1.244.250	1
Biscuits	1.596	564	900.144	5
Beer	595	758	451.010	0.2
Soft Drink	438	260	113.880	0.1
Fruit Cordial	275	263	72.325	0.1
Butter and Margarine	232	547	126.904	1.3
Soy Sauce	177	339	60.003	0.2
Powdered milk	123	1.056	129.888	0.5
Frozen Chicken	86	2.000	172.000	0.2
Potato Chips ('Twisties')	83	1.625	134.875	0.3
Lollies	83	250	20.750	0.2
Peanut Butter	70	1.153	80.710	0.3
Instant noodles	66	700	46.200	0.1
'Milo'	55	1.363	74.965	0.2
Baby Formula Powdered Milk ('Lactogen')	40	1.500	60.000	0
Cheese	22	500	11.000	0.1
Tea	18	4.000	72.000	0
Fresh Beef	13	250	3.250	0
Total	**191.960**		**29.346.275 (Approx AUS $ 345.250)**	**537.8**

Notes:

1. ***66 percent of products were imported by people who operate stores on Malo; whilst the remaining 34 percent were imported by private residents.***
2. ***These figures were based on price data obtained from the cooperative stores at Matunatari and Nanuku, and therefore represent the prices per kilo paid by people on Malo.***

ENDNOTES

1 Matthew Allen is a Masters student in the Department of Geography, Australian National University.

2 It seems that this settlement pattern came about as a consequence of early Presbyterian missionary activity (about 100 years ago), which was concentrated on west Malo.

3 Indigenous commercial coconut cultivation commenced about 80 or 90 years ago, but was not widely adopted until the 1960s and 70s. The 1970s was also the decade in which the Maloese started to produce cocoa as a cash crop. The sale of fresh produce at the market in Luganville is a relatively recent cash earning activity, having only commenced in the last ten years or so.

4 According to Conklin:"Shifting cultivation may be defined as any agricultural system in which fields are cleared by firing and are cropped discontinuously (implying periods of fallowing which always average longer than periods of cropping) " (Conklin 1957: 1).

5 Exports of copra and cocoa from Malo are an important exception to this state of affairs. The majority of copra and cocoa exports from Malo are taken by boat directly to the VCMB purchasing office in Luganville. The VCMB is the sole exporter of copra and cocoa from Vanuatu, and all of the copra and cocoa produced on Malo is ultimately sold to the VCMB office in Luganville. Consequently, data concerning the production of these commodities on Malo was obtained from VCMB purchasing records in Luganville.

6 Although both men and women participate in the initial stages of copra and cocoa production, it seems that men are generally responsible for the marketing stage. Consequently men, rather than women, receive the money at the end of the day. Furthermore, my observations suggest that it is mostly men who are employed as casual labourers on coconut plantations.

7 Description of the methodology employed in the Naonepan survey is beyond the scope of this paper, but can be found in Allen (thesis, in preparation).

8 Malo is a net-importer of both kava and Colocasia taro. These crops do not grow very well on Malo, probably because of insufficient rainfall.

9 The extraordinary contribution made by marou yams to the total value of products marketed by vendors from Malo is due to two main factors. Firstly, these yams are cultivated only on Malo, and are consequently sold exclusively by vendors from Malo. Secondly, marou yams are extremely popular with ni-Vanuatu consumers, apparently because of their superior taste and their long dormancy period.

10 It should be noted that this paper has focused only on the positive aspects of the changes which have been brought about by the move into the cash economy. The advent of a modern trading sector, and the substitution of subsistence with economic production, means that food supply on Malo has now become partially dependent upon international economic forces which are entirely beyond the control or influence of the Maloese. This situation is discussed in depth in Rodman's study of the consequences of cash cropping on Ambae Island (Rodman 1987). Moreover, cash cropping (particularly of coconuts), in conjunction with population growth, has been placing pressure on the amount of land available for subsistence. This in turn has caused increases in the intensity of subsistence land use, which may lead to soil degradation in the long term.

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