

SECTION II.
THE TARGET AREAS
KANGGIME AND KEMBU-MAMIT SUB-DISTRICTS

1 GEOGRAPHY, ENVIRONMENT AND ECOLOGY

The Sub-districts of Kanggime and Kembu-Mamit are situated in the north-western most corner of Jayawijaya District, between the latitudes of 3^o and 4^o South and the longitudes of 138^o and 138^o 40' East, on the northern slopes and foothills of the Snow Mountains or Central Ranges of New Guinea. Kanggime Sub-district incorporates approximately half of the upper watershed of the Toli or Swartz River, the other half being located in the neighboring Sub-district of Karubaga. Kembu-Mamit lies directly north of Kanggime and Karubaga and covers most of the Toli's mid and lower watershed as well as the watersheds of the Kembu (Doorman) River and several other minor tributaries of the lower Idenburg River.

To the north, the Kembu/Mamit Sub-districts are nominally bordered by the Idenburg and Rouffaer Rivers which converge at the northernmost point of Kembu-Mamit Sub-district to form the Mamberamo River. However, in practice the areas lying on the swampy plains to the south of the Idenburg and Rouffaer Rivers are beyond the control of the administration in Jayawijaya and communities living in these areas are serviced and administered from Jayapura District.

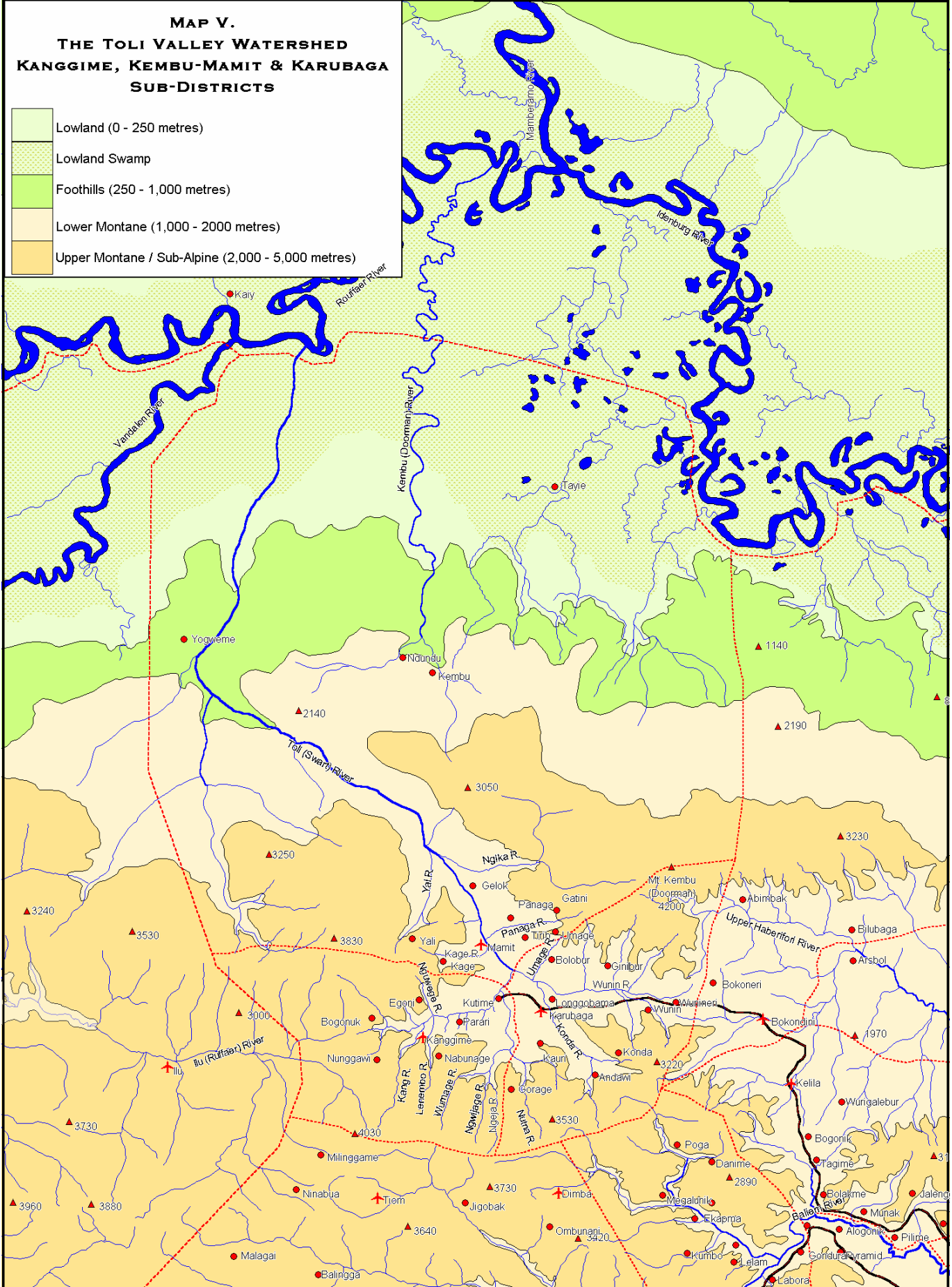
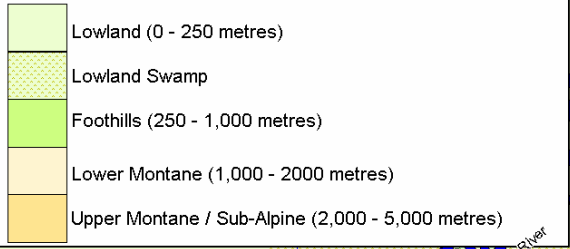
To the west of Kanggime and Kembu-Mamit lies Ilu Sub-district in Puncak Jaya District. Located in the Yamo or upper Rouffaer River Watershed that was, up until 1996, a part of the former Nabire District. The adjacent areas of Puncak Jaya are both geographically and culturally very similar to Kanggime and Kembu / Mamit Sub-districts and social and economic ties between the communities remain strong.

To the east of Kanggime and southeast of Kembu-Mamit lies Karubaga Sub-district. This sub-district is located around the Konda River Valley, which converges with the Toli River Valley near Mamit. Up until 1997 Kanggime, Kembu / Mamit and Karubaga were all administered as one sub-district with the sub-district headquarters located in Karubaga.








To the east of Kembu-Mamit (and north of Karubaga) lies the Bokondini Sub-district. This sub-district incorporates part of the watershed of the Upper Hablerifori River. Once again the communities living in Bokondini are linguistically, socially and economically quite closely related to the Toli Valley Communities.

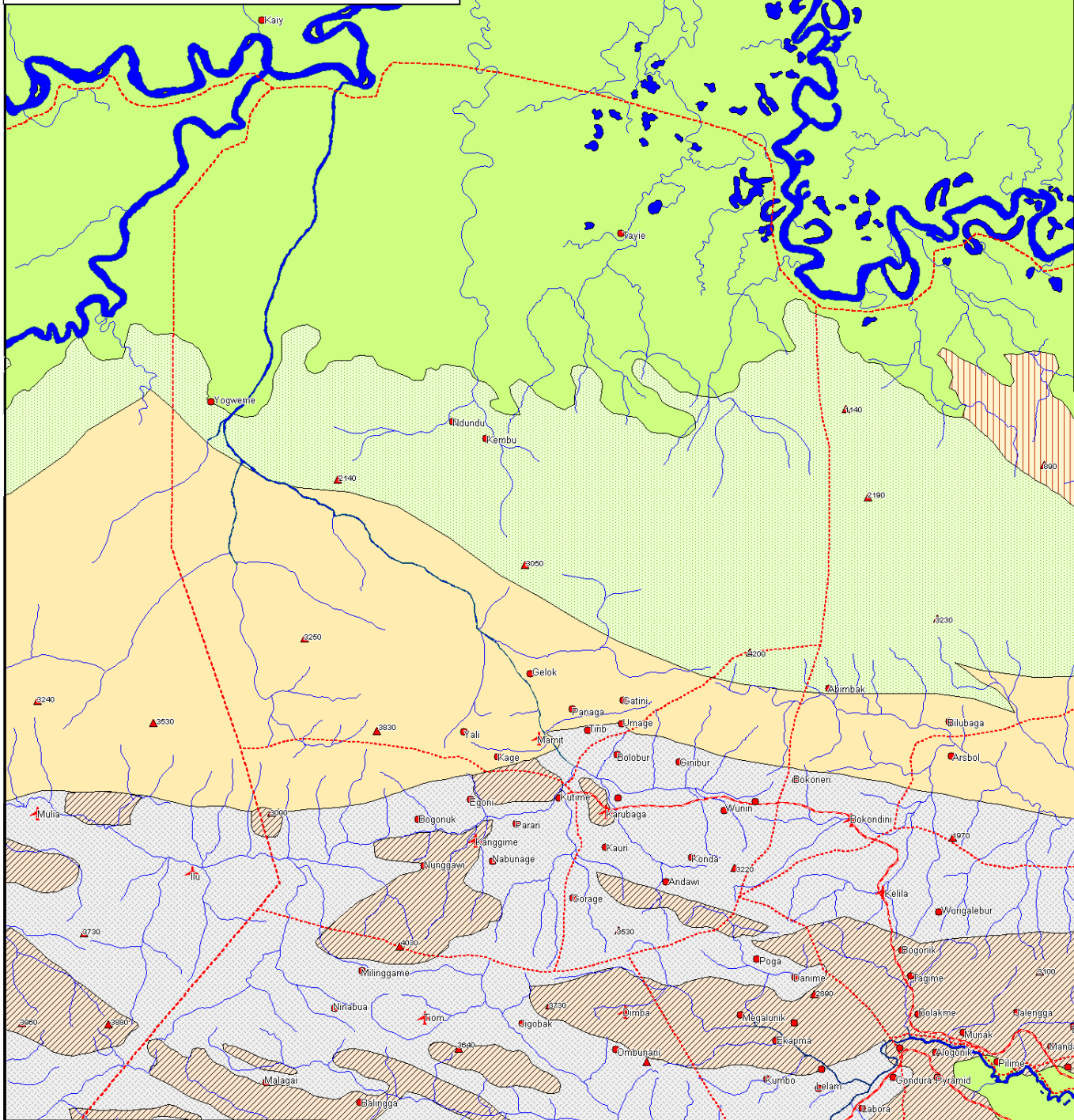
To the south, the Kanggime Sub-District is separated from the Tiom Sub-district in the North Baliem River watershed by a ridge of major mountain peaks. Tiom, along with the Ilaga Valley in Puncak Jaya District are home to the largest populations of Lani people and form the heartlands of the ethnolinguistic group.

MAP V.
THE TOLI VALLEY WATERSHED
KANGGIME, KEMBU-MAMIT & KARUBAGA
SUB-DISTRICTS



MAP VI.
GEOLOGY OF THE TOLI VALLEY WATERSHED
KANGGIME, KEMBU-MAMIT & KARUBAGA
SUB-DISTRICTS

-  Predominately Alluvium
-  Irian Jaya Ophiolite Belt
(Ultrabasic and ultramafic intrusions
including serpentinite, peridotite, pyroxenite & gabbro)
-  Various predominately metamorphic rocks
(Including slates, schists, marbles, meta-sandstones and some metavolcanics)
-  Various - predominately marine sedimentary rocks
(Including mudstones, sandstones, shale, siltstone and dolomites)
-  Marine sedimentary rocks
(Predominately tertiary deep water and reef faecies limestones)
-  Predominately basaltic to andesitic lavas
-  Predominately volcanically derived conglomerates, mudstones & sandstones



By Indonesian standards Kanggime and Kembu / Mamit are extremely large sub-districts having a total area of approximately 4,000 kilometres² or almost the size of the island of Bali. Kanggime Sub-district has an area roughly 550 km² whilst the area of Kembu-Mamit appears to cover over 3,400 km². This area is an estimate because the northern boundary has poor delineation.

The Kanggime and Kembu / Mamit Sub-districts can be roughly divided into four distinct ecological zones, each of which is described below.

1.1 MAMBERAMO LAKES PLAIN ECOLOGICAL ZONE

The Mamberamo Lakes Plain Ecological Zone lies along the northern boundary of Kembu / Mamit Sub-district. It runs in a broad band about 25 km wide along the southern bank of the Idenberg and Rouffaer Rivers ending at the lower reaches of the Toli River. The Lakes Plain also extends for hundreds of miles to the east and west along both banks of the Idenberg and Rouffaer Rivers and north along the Mamberamo River. This zone ranges in altitude from between 100 meters to 250 meters above sea level and is characterized by freshwater swamps that intersect with numerous slow moving rivers. Almost the entire zone is still covered in tropical lowland rainforest. Average daily temperatures in this zone range between about 20°C and 35°C and the relative humidity is invariably very high. In this zone the rainfall is very high throughout the year as there is only a limited dry season.

In general the soils in this zone are alluvial and thus very fertile however agricultural production is limited because most soils are either permanently or intermittently inundated with water. The main crops in this area are wild cultivated sago (*Metroxylon sagu*), swamp taro and plantain banana. Hunting and fishing also provide a large proportion of the diet of the inhabitants of this zone.

The Mamberamo Lakes Plain is recognized as having amongst the highest incidence of malaria in the world and the people there are commonly afflicted with other conditions such as diarrhea, dysentery, tropical ulcers and skin conditions. The extremely high incidence of disease found in this area is to some extent countered by the fact that people living in this zone generally have a quite high protein intake due to the ready availability of fish.

The WATCH staff have not really targeted their health interventions in this region as many of the project activities are aimed at highland communities and are therefore of little relevance to communities living in the Mamberamo basin. Furthermore, whilst this area is nominally administered from the sub-district headquarters at Mamit, because of its remoteness from Mamit and the lack of boats with which to travel around this area, communities in this zone tend to be serviced and administered out of Jayapura District. Even still Lani people from Kanggime and Kembu-Mamit continue to visit this area on a fairly regular basis in order to hunt, gather or otherwise acquire commodities unavailable in the highlands. Such commodities include black palm wood (*Caryotta sp.*) for the production of high quality bows, medicinal cinnamon bark (*Cinnamomum sp.*) and other lowland plant and animal resources. They also visit this area to trade pigs and other commodities from the higher altitude areas. It seems likely that such trade would on occasion include the trading of pigs or other

commodities for lowland brides². Visits to the Mamberamo basin seems to contribute to the high incidence of malaria in the highland areas of Kanggime and Kembu-Mamit.

1.2 FOOTHILLS / LOWER MONTANE ECOLOGICAL ZONE

Immediate south of the Mamberamo Lakes Plain Zone the terrain changes to hilly country that rises up to the central ranges of New Guinea. This zone lies between approximately 250 meters and 1,000 meters above sea level and much of it is still covered in foothill and lower montane rainforest.

Rainfall levels in this zone are also high throughout most of the year. Although the average temperature and relative humidity is generally somewhat lower than in the Mamberamo Lakes Plain Zone, most of this zone is still very hot and humid.

Geologically, most of the foothill / Lower Montane Zone in Kembu-Mamit is dominated by a formation known as the Irian Jaya Ophiolite Belt. This formation is largely made up of intrusive serpentine and ultrabasic rocks that have been pushed up from deep under the Earth's surface and can contain extremely high concentrations of heavy metals such as copper and Zinc. As a result of the presence of these heavy metals in the soils many soil nutrients required for healthy plant growth may be locked up. The wild vegetation growing on such soil types has adapted to the conditions of low nutrient availability however, most agricultural crops will perform relatively poorly under such conditions. Due to a lack of accurate data concerning soil types and agricultural production for this area it is not possible to determine to what extent local soil conditions throughout this zone affect agricultural production and population sizes.

Foothill and lower montane areas throughout Irian Jaya are noted for their extremely poor health conditions. This is has been linked to the fact that at such altitudes lowland diseases such as malaria, ulcers and skin diseases are still endemic however as they do not live in a swamp, people who live directly south of the Mamberamo Lakes Plain Zone do not have as much access to fish and thus they lack an adequate source of protein.

1.3 TOLI RIVER VALLEY ECOLOGICAL ZONE

The Toli River Valley Ecological Zone is located in the upper watershed of the Toli River and its main tributaries. It is a system of divaricating V shaped valleys which begins in the southern part of the Kembu / Mamit Sub-districts and extends across the Kanggime as well as the neighbouring Karubaga Sub-district. This zone lies at altitudes between approximately 800 and 2,500 metres above sea level. Ecologically the Toli River Valley Ecological Zone is fairly similar to other intra-montane valley systems throughout the central highlands

2 Amongst those living in the highlands fringe it is popular to trade for a bride from lowland communities. The lower customary bride prices amongst lowland communities offsets the desire for a wife from the highlands as highlands women are considered to make better wives. This practice may be significant for a project like WATCH because non-highlands women who have married into highlands groups may find themselves more isolated and in need of outside assistance than local women.

of New Guinea (i.e. the Baliem, Swartz, Ilu, Beoga and Ilaga Valley Systems). The native vegetation in this zone has experienced a high level of disturbance due to the extensive clearing of the forest for agriculture. Yet scattered throughout this zone are patches of remnant mid-montane rainforest and many patches of forest regrowth and planted groves of trees. This zone is fairly mild with an average daily temperature range of 13°C - 29°C. This average is based on measurements from the district headquarters of Kanggime, approximately 1,400 metres above sea level. Particularly at higher altitudes, it is common for fog to shroud much of the area until mid morning and for low cloud to settle on the peaks and ridges during the early afternoon, often bringing with it afternoon showers. Due to the effects of higher altitudes the relative humidity in the Toli Valley is much lower than in the Mamberamo Lakes Plain and the Foothill / Lower Montane Zones and rainfall levels are also slightly lower due to the rain shadow effects caused by the surrounding mountain peaks. Although the months between November and April are normally the wettest, there is still no significant dry season in this zone.

The Toli River Valley Ecological Zone cuts through two major geological formations. In Kembu / Mamit sub-district the valley dissects a belt of metamorphic rocks including slates, schists and marbles whereas in Kanggime Sub-district it cuts through a formation of sedimentary rocks including mudstones, sandstones and shales. Limestone outcrops and karst (cavernous limestone) terrain also occur in a number of places in this zone, most notably around Kuttime (located on a small limestone plateau) and the area south of the Toli Valley and west of Kanggime Airstrip. Most soils on the valley floors are deep black sandy loams with high humus content. These soils are very fertile, if somewhat deficient in potassium, and consequently this zone has the highest agricultural productivity and population levels in Kanggime and Kembu / Mamit Sub-districts. The gardens built in the valley floors, however, are susceptible to periodic flooding. The slopes of these valleys are fertile too yet the soils are often poorer and thinner than those found on the valley floors and erosion is a constant concern. The whole area is tectonically active and minor earthquakes are, on average, recorded several times per year.

Consistent with the belief that malaria is not generally transmitted at altitudes in excess of 1,500 meters, malaria is much less common in this zone than at lower altitudes. People living at higher altitudes in Kanggime and Kembu / Mamit are likely to get malaria when they travel to lower altitude areas from time to time. In addition, malaria continues to constitute a serious health risk for people living in this zone because the altitude at which malaria can be transmitted will vary somewhat depending upon prevailing weather conditions (as happened during the 1997 - 1998 ENSO drought). The incidence of diarrhea and dysentery in this zone is also somewhat lower due to the fact that people in this zone live in closer proximity to the main water catchments than their downstream neighbors. Respiratory tract infections are the most significant health problem in this region and this it seems is due to the cooler conditions and the smokiness of indigenous housing.

1.4 UPPER MONTANE / SUB-ALPINE ECOLOGICAL ZONE

The Upper-Montane and Sub-Alpine Ecological Zone comprises of the rugged mountain terrain in the Kanggime and Kembu / Mamit Sub-districts. This zone starts at an altitude of around 2,000 - 2,500 meters above sea level and extends to the summits of the highest peaks in excess of 4,000 meters above sea level. This zone is still largely covered with native vegetation including oak and conifer forests in the upper montane areas

and tree fern savannahs, Rhododendron shrubberies and stunted Aelfin@ woodlands in the sub-alpine areas. The rainfall patterns in this zone are very high and the temperatures range from cool to cold with areas above 3,000 meters above sea level experiencing frost and snow on a fairly regular basis.

Geologically the northern part of this zone is characterized by metamorphic rocks including slates, schists and marbles whereas the southern areas are made up of a range of marine sedimentary rocks including mudstones, sandstones, shales etc. This area also features outcropping limestones particularly around the highest mountain peaks. The geomorphology is quite complex and includes small moraines and glacial valleys formed during previous ice ages and various karst or cavernous limestone features including dolines, sink holes, karst pinnacles, caves and underground rivers.

Soil types too vary considerably throughout this zone. While there are fertile soils here, high altitudes, cold conditions and rugged terrain severely restricts agricultural activity in this zone. The main exception to this is the extensive stands of Pandanus nut trees (*Pandanus conoides* & *P. julianettii*) along the forest fringes (between 2,000 and 2,600 meters above sea level). These Pandanus groves occur naturally but are maintained and harvested by local people. Hunting of tree kangaroos, cuscus, native rats, mountain cassowary, bats and birds and the collection of various other materials and foodstuffs from these areas are main human activities in this zone. In the past much of this zone was considered sacred or taboo by local people and this functioned to preserve the quality of water flowing from this zone into the more heavily populated Toli Valley as well as providing a sanctuary where wild game can breed with little or no human disturbance.

1.5 CLIMATIC PATTERNS AND ENSO EFFECTS

In 1997-1998 much of Jayawijaya was severely afflicted by a drought linked to the phenomenon known as the El Nino Southern Oscillation (ENSO). In many areas agriculture was seriously disrupted by the drought and its associated frosts and wildfires and many people had difficulty locating clean drinking water. Development workers noted how at this time there was a significant increase in the incidence of a wide range of diseases. Research has shown that the 1997-1998 drought was not an isolated incident. Indeed there is evidence of a number of similar droughts effecting areas across Irian Jaya and neighboring Papua New Guinea in 1914/15, 1941/42, 1972/73 and 1982/83 (Ballard, 1999). Evidence regarding the severity of these various droughts in Irian Jaya is very limited yet based on experiences during the 1997 - 1998 drought as well as historical accounts from local people, missionaries and others it appears that there is a fairly predictable pattern of drought severity in Irian Jaya. The pattern that emerges is that droughts in Irian Jaya are most severe on the south face of the central ranges and increase in severity from west to east with the worst affected areas being around Ok Sibil and Langda (on the south face of the range close to the PNG border). It seems that karst or cavernous limestone terrain and particularly steep terrain have increased the severity of drought by increasing the rate of surface run off. For those settlements lying above 2,200 meters altitude, drought leads to heavy frosts, destroying sweet potato crops.

Kanggime and Kembu / Mamit Sub-districts would seem to be only minimally affected by these types of ENSO related weather patterns for a number of reasons. Firstly, being located on the north face of the central ranges and approximately 400 kilometers west of the PNG border, Kanggime and Kembu / Mamit lie outside the range of the most severe ENSO related climatic drying. Furthermore, terrain in the more heavily populated areas is, by Papuan standards, gentle and the main areas of karst in these sub-districts are located beyond the range of human habitation in the Upper-Montane / Sub-Alpine Ecological Zone. Finally, human habitation patterns in Kanggime and Mamit are generally restricted to areas below 2,200 meters above sea level. This means that few if any gardens were destroyed by frost as was reported to have happened in settlements at higher altitudes such as Kwiyawagi and Yogosem (in Jayawijaya District) and Ilaga and Agadugume (in Puncak Jaya District).

The fact that agricultural production in Kanggime and Mamit was not as adversely affected by the 1997 - 1998 drought as many other areas in Jayawijaya were is attested by the fact that during the height of the drought villagers from Kanggime, Kembu / Mamit and other areas along the northern edge of the central ranges continued to bring small amounts of produce to the market at Wamena. In contrast, other areas to the south and east were reported to be experiencing famine. This is not to say that the people of Kanggime and Kembu / Mamit Sub-districts did not suffer as a result of the drought. In fact, agricultural production was severely reduced and the local people experienced a range of problems including malnutrition, a considerable increase in the incidence of malaria, diarrhoea and other diseases and brush fires which destroyed gardens, houses, Pandanus trees and forest resources.

1.6 EARTHQUAKES AND LANDSLIDES

The other major environmental risk facing the inhabitants of Kanggime and Kembu-Mamit, as well as most other communities in Jayawijaya is that of earthquakes and landslides. The Central Cordillera of New Guinea is still being rapidly uplifted by a collision between the Australian and Pacific crusts and consequently the whole area is very seismically active. Whilst there are no reports of significant seismic activity in the target areas in the recent past, it is only a matter of time before such disturbances do affect the area. During the 1990s at least two major earthquakes affected communities around Soba and Angguruk. Whilst few people were actually injured in these earthquakes, the ensuing landslide caused many deaths, damage to property and malnutrition. The government's response to these disasters has been to distribute emergency relief and to encourage community members to relocate to areas along the Trans-Irian Road. This itself caused further hardship as community members who did relocate were cut off from other relatives, found that the agricultural productivity of their new land was quite low and suffered a considerably increased incidence of malaria. Whilst earthquakes obviously cannot be prevented, development planner and practitioners should be aware of their likelihood and try to help communities to become better prepared for such eventualities. Furthermore, the high level of seismic activity in the target areas is likely to have some impact upon community attitudes towards ideas such as more permanent forms of architecture or gardening systems. .

2. HISTORY OF CONTACT

2.1 PRECONTACT HISTORY

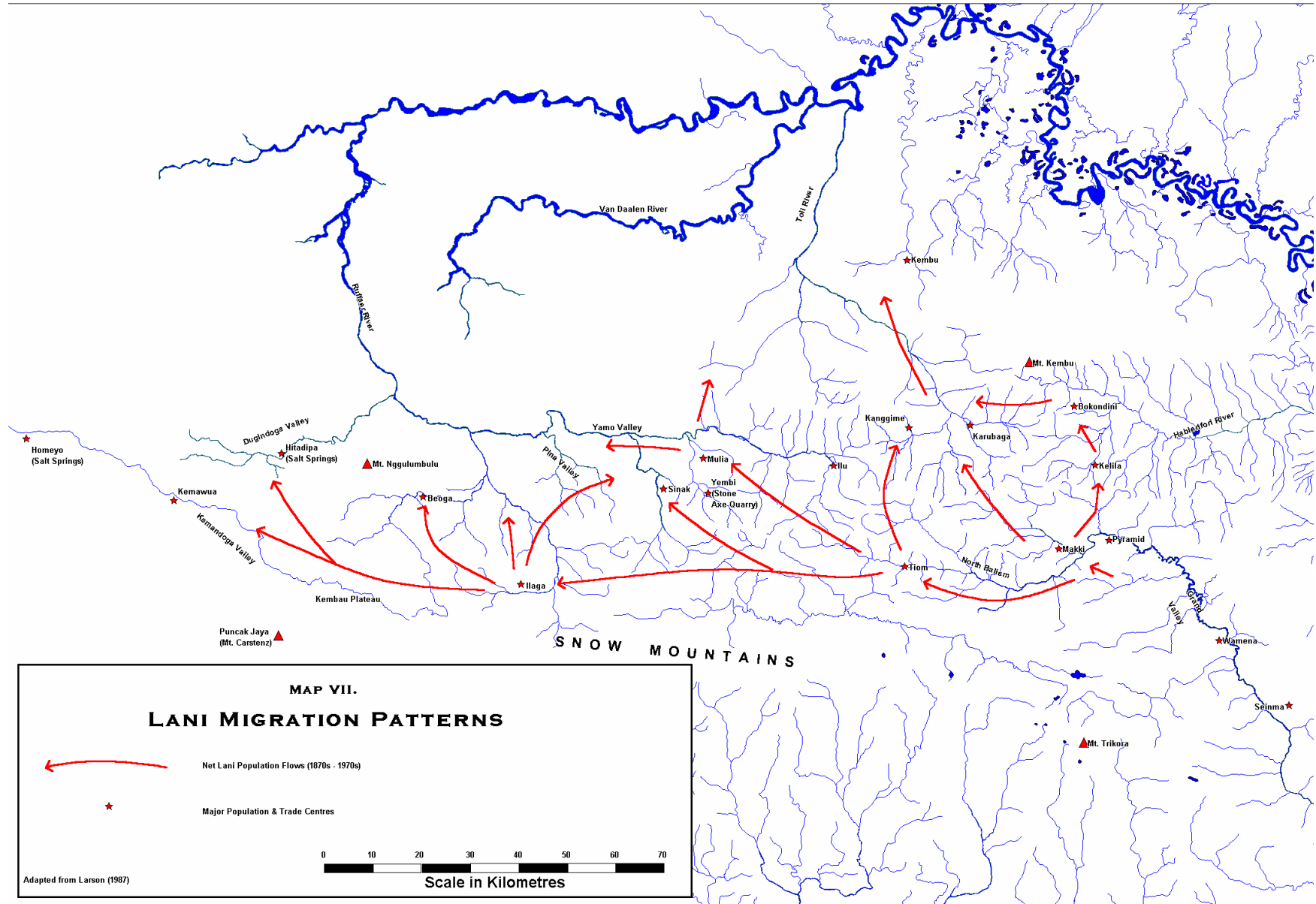
Due to the non-literate nature of highland Papuan communities and the perishing effects of the climate, almost nothing is known about the history of the Toli Valley Lani or for that matter about most other highland communities in Jayawijaya.

A number of academics³ believe that the Lani ethnolinguistic group descend from a group, or more probably from several groups, of Grand Valley Dani who were only relatively recently driven from the Grand Valley area but whose culture and language have since diversified. Larson in particular has attempted to map the net migration flows of the Lani over the last century and the relationship of these migrations to cycles of warfare (see map VII). According to Larson's analysis the Toli Valley has been settled in fairly recent times by groups of Lani moving in from the Tiom / North Baliem area to the north and also from the Bokondini and Kelila areas in the Upper Hablerifori River area to the east. These people had themselves been forced out of the Upper Grand Valley area by warfare resulting from social or population pressures. Larson's theory is supported by the results of O'Brien's research. She argues that most of her informants from the Jikwa clan who live around Karubaga had, migrated to the area from the Upper Grand Valley via the Upper Hablerifori some time between 1913 and 1922. Her other informants had recognised themselves as being descended from relatively recent émigrés from the heavily populated Tiom area in the North Baliem Watershed. If Larson's theory is correct then the Toli Valley represents a point of convergence for two separate migratory flows away from the Grand Valley and the culture and language of the Toli Valley communities would be a mix of two divergent strains. Patterns of variations and similarities between the four main accounts of the Lani in the Toli, Ilaga, Mulia and Bokondini areas support this idea as they portray the Toli area as sharing many linguistic and conceptual elements of both the North Baliem-Ilaga-Jamo areas and the Upper Hablerifori cultures (which Larson regards as being the most linguistically aberrant of the people classified as Lani). This theory of exodus from the fertile Grand Valley has also been linked to what Ploeg (1969) has described as 'societal intensification due to environmental stress' (see section II / 4.1.5).

2.2 FIRST CONTACTS

Members of an expedition lead by L.A.C.M. Doorman first glimpsed the valleys of the Toli River catchment in 1914. The objective of this expedition was to ascend the highest peak in the area, a peak the expedition named Doorman Top and the locals call Mt. Kembu. Although members from this expedition did not make contact with any Lani, they did report seeing what appeared to be quite large human populations inhabiting the valleys immediately south of Mt. Doorman / Kembu.

3 See O'Brien (1969), Ploeg (1989), Larson (1989) & Hayward (1992)



Homeyo
(Salt Springs)

Dugindoga Valley
Hifadipa
(Salt Springs)

▲ Mt. Nggulumbulu

Kemawua
Kemendoga Valley

Kembau Plateau

▲ Puncak Jaya
(Mt. Carstenz)

Yamo Valley
Pine Valley

★ Beoga

★ Sinak

★ Mulia
Yembi
(Stone
Axe-Quarry)

SNOW MOUNTAINS

Toi River

★ Kembu

Kanggime

★ Ilu

★ Karubaga

▲ Mt. Kembu

★ Bokondini

★ Kejila

Habloford River

★ Tiom

North Belem

★ Makki

★ Pyramid

Wamena Valley

★ Wamena

Selima ★

▲ Mt. Trikoba

In 1920 a Dutch expedition led by A.A.J. van Overeem attempted to approach Mt. Wilhelmina / Mt. Trikora from the north via the Toli Valley⁴. The expedition only managed to travel as far as the lower Toli River before being forced to turn back. Van Overeem named the river the Swartz after one of the expedition's backers. This expedition reported contact with two tribal groups whom were referred to as the Oeringoep and the Timorini. Whilst SIL has ascribed both of these names as referring to the Lani ethno-linguistic group (Grimes, 1996), Denise O'Brien states that these two names were meaningless to her Lani informants in the Konda and Toli Valleys (O'Brien, 1969: 7).

The first confirmed contact between the Toli Valley Lani and the outside world occurred in 1921-1922 when the Kremer expedition passed through the area on its way to and from Mt. Trikora. This expedition traveled southeast from the confluence of the Idenburg and Rouffaer Rivers across the swampy plains to the Kembu River. The Kembu was then followed upstream and the expedition scaled Mt. Doorman (Mt. Kembu) before descending into the Toli Valley to the south. Part of the expedition including an ethnologist remained in the Panaga area near Mamit for a period of about two months⁵ while the rest pushed on through the upper Toli Valley and across the North Baliem to Mt. Trikora before returning via the same route. This was not only the first confirmed contact between any Lani group and Europeans, but also the first contact with people from islands in modern western Indonesia as the expedition employed Dayaks from Borneo and Malays as porters.

Shortly after the Kremer expedition an epidemic of what was probably dysentery seems to have swept through the Toli Valley Lani populations. This epidemic fuelled fears that the newcomers were spirit men and it initiated discussion as to where and why the spirit men hid their women and why they had suddenly arrived and then just as suddenly disappeared again. O'Brien writes of a common story whereby the white men were believed to be concealing their women in the canisters which they carried with them. When they released them from their canisters the women appeared as snakes to the Lani but as women to the spirit men. Larson too tells a story from the Ilaga Valley, a place that had no contact with the Kremer Expedition or any other until 1951, with snake imagery. Here it is said that the sudden departure of the spirit men and the following epidemics was a result of the accidental killing of one of these snake women by a Lani man. Both of these tales are linked to Lani origin myths that revolve around the outcome of a race between an ancestral bird and snake. Because the bird won the Lani are descended from the mortal birds whilst the spirit men are the descendants of the immortal snakes who left the highlands to live on the north coast. It is interesting that both Larson and O'Brien express surprise that subsequent contact with the Toli Valley Lani was not more violent given that first contact seems to have caused such widespread suffering and had such a profound impact.

After the Kremer expedition the Toli Valley Lani have had no reported contact with the outside world until some 45 year later when the first missionaries arrived in the area. A number of other expeditions, most notably the 1926 Stirling Expedition⁶, which contacted Lani Groups in the Jamo Valley area, and the 1938-39 Archbold

4 See Bijlmer (1922) and Le Roux (1950).

5 See Kremer (1922-23), Wirz (1924) and Le Roux (1950).

6 See Stirling (1943).

Expedition⁷, which is credited with discovery of the Grand Baliem Valley, did travel into the Jayawijaya Highlands and make contact with other highland communities during this period but none of them passed through the Toli watershed. However during the American occupation of Hollandia in World War II, Toli Valley communities were startled by military aircraft that occasionally passed overhead.

2.3 MISSIONS

After World War II Australian, American and European missionaries began to explore and rapidly establish a network of mission posts and grass airstrips across the highlands. The first phase of missionary exploration and expansion in the highlands of Irian Jaya used the government and mission station at Enarotali some 300 km to the west of the Toli Valley as a base. This station was established prior to the war and evacuated in 1941 before the Japanese advance into the area. After the cessation of hostilities the post was quickly reopened and both Catholic and Protestant missionaries began to evangelise the neighbouring Ekari, Moni and other local ethnic groups. During the early 1950s several parties of missionaries penetrated into the Lani territory yet they did not travel further east than the Ilaga Valley in modern Puncak Jaya District⁸. During this period corn seems to have spread from its initial point of introduction at Enarotali as far east as Pyramid on the western end of the Grand Baliem Valley.

The second phase of missionary exploration and expansion in the highlands of Irian Jaya commenced with the founding of Wamena in the mid 1950's. Using a seaplane to land on the Baliem River, in 1954 missionaries from the Christian and Missionary Alliance (CAMA) established the first mission post in Jayawijaya at Hitigima in the Lower Grand Baliem Valley. From this new base Protestant Missionaries began to rapidly establish a network of posts and airstrips across Jayawijaya. In 1956 a government post was established at Wamena just 10 km north of Hitigima and in 1958 the Catholic Church also established a mission station at Wamena.

In 1956 a mission post was built in Bokondini and in April 1957 a group of two American's from the Regions Beyond Missionary Union (RBMU) and several labourers from the north coast set out on foot from Bokondini to establish the first post in the Toli Valley watershed. This group seems to have encountered few problems with the local community and by June 1957 they had completed the construction of an airstrip at Karubaga in the Konda Valley. Shortly after the completion of this airstrip several mission families, including the first foreign women and children they had ever seen, arrived in Karubaga by plane. Over the next few years the mission population at Karubaga fluctuated somewhat but it generally consisted of three to six adults and one to four children and included people of Canadian, Australian, British, Dutch and Greek extraction. During these first few years the RBMU missionaries principally engaged in the construction of the mission station, improving the airstrip and getting to know the local community. They also explored other part of the Toli watershed and established two further mission station, one at Kanggime in June 1960 and the other at Mamit in November of the same year.

7 See Archbold, Rands & Brass (1944).

8 See Hitt (1962).

The establishment of missions in the Toli Valley appears to have caused massive economic dislocation amongst the Lani communities. After all, to build the mission stations and the airstrip as many as 400 Lanis were employed in a day and they were paid mostly in cowrie shells though trade goods such as axe heads were also used. The amount of cowrie shells distributed in the manner must have been quite staggering. A Swedish naturalist who visited the Karubaga Station during this period claimed that as many as 80,000 cowries had been distributed during the first eight months that the mission was in Karubaga⁹.

The presence of the missions also altered population patterns because many people began to settle in more permanent and populous villages around the mission stations. Conversely, other people who were not so supportive of the missions, and subsequently the government when it established posts in the area, presumably moved further away from the population centres either to locations further up the mountains or further out into the lower montane and foothill areas on the north face of the Kambu-Ndundu ranges. This movement away from the missions may account for the current presence of Lani communities in the northern parts of Kambu-Mamit Sub-district when earlier expeditions report no Lani here.

Mission influence spread fairly rapidly throughout 1957 – 1959 and was boosted in March 1960 when communities across the Toli watershed were caught up in a wave of mass fetish burnings that had begun in Ilaga far to the west but had swept right across the Lani territory. Whilst the missionaries disapproved of the mass burnings, believing that they were based upon false interpretations of the gospel, they also capitalised on them by using the opportunity to bring a larger percentage of the local population to the Church¹⁰.

The missionary population in the Toli valley (Karubaga, Kanggime and Mamit) peaked during the late 1970s and early 1980s (there were about 10 families there) but by 1990 the last missionaries had left the area. When the missionaries were present a sizeable vegetable trade saw around 2000 kg of vegetables per week being sent from the region to missionaries in other parts of Irian.

The last major tribal battle in the Toli valley area is said to have occurred in April 1961. The cessation of tribal war seems to have come about fairly easily as a result of the mission's influence rather than through government or military coercion.

2.4 GOVERNMENT

The first government station in the Lani territory was opened at Bokondini in March 1959. Only one Dutch Patrol Officer and a small detachment of native police attended the post up until October 1962. During this period only three government patrols visited the Toli Valley and none of these remained in the area for more than a few days. For the six months of United Nations Administration a Papuan from the north coast was placed in charge of the post. The post was taken over by Indonesian Officials in May 1963 though actual administrative policy remained similar to what it had been under the previous two administrations. That is

⁹ See Bergman (1961).

¹⁰ See Hitt (1962), Hayward (1992), Larson (1987), O'Brien (1969) and Godschalk & Strelan (1989).

Indonesian Officials were not actively engaged in any sort of community development or other programs, they simply supported the work of the missions and maintained a presence.

Government presence and control over the Toli – Konda Valley area remained quite marginal until 1978 when a government post opened at Karubaga. This post, as well as many others established across Jayawijaya and Puncak Jaya at this time, was established in response to a period of civil unrest that spread across the Lani communities as well as some other closely linked groups. These disturbances alerted the government to the fact that they needed to take a much more active role in providing remote communities with access to health care, education and economic opportunities if such disturbances were to be avoided in the future. For the ensuing 20 years the areas now known as Karubaga, Kanggime and Kembu-Mamit were jointly administered as Karubaga Sub-district from the government post at Karubaga. For most of this time the missions remained the main providers of education and health services in the area but their role decreased sharply during the late-1980s and 1990s as the government took increasing responsibility for such services. In 1998 Karubaga Sub-District was divided into three sub-districts and new government posts were established at Kanggime and Mamit. At this time the former mission health centres at Kanggime and Mamit were also designated the status of government run community health centres (*puskesmas*).

2.5 WORLD VISION IN KANGGIME & KEMBU MAMIT

World Vision International Indonesia (WVII – the implementing partner for the Jayawijaya WATCH Project) established their first development project in the Highlands of Irian Jaya in 1979. At this time they supported a PHC project run by the Unevangelised Fields Mission amongst Lani communities in the Mulia area of what is now the Puncak Jaya District. This collaboration resulted in the establishment of eighteen new village health posts within two hours walk from most villages. A total of 38 village health workers received two years training and a total of 67,000 patients were treated (an average of 2-3 treatments per person per project year). Ten maternal and child health and nutrition centres (*posyandu*) were built and 1,200 women participated in various health education programs. Clean water was supplied to 80 villages, hundreds of toilets were built, and a large percentage of the local children were immunised. A local management committee was also established and a fairly successful scheme for ongoing community financing of health programs was established. By 1985, with assistance from AusAID, the mission hospital at Mulia was graduating 20 nurses per year most who have since been employed by the government.

WVII's involvement was subsequently extended eastwards and in 1981-1982 three projects in Jayawijaya District were established. These included two projects in the Toli-Konda Valley area (what is now the Karubaga, Kanggime and Kembu-Mamit sub-districts) and another in the Tiom Area (North Baliem). These projects were similar to the Mulia Project as they worked with local missions and focused on the development of health infrastructure, the training of health workers and other curative oriented activities. After the completion of these projects in the mid-1980s WVII maintained support for community development activities in the area via their child sponsorship program. During the mid-1990s in Kanggime and Kembu-Mamit WVII established an Area Development Program (ADP) that aimed to implement an integrated package of PHC and community development interventions in a nine-year period.

Thus WVII has a long history of involvement with the communities in the target areas and has undoubtedly had considerable impact upon the lives of many. For the WATCH project, the history and precedents set by its parent / implementing organisation proved to have both positive and negative impacts on the project's implementation of PHC and community development activities.

3 THE HUMAN POPULATION

3.1 POPULATION STATISTICS

The most recent and reliable data regarding the human populations of Kanggime and Kembu / Mamit Sub-districts was collected as part of the 1996 government census. According to this source Kanggime Sub-district has a population of 15,382 including 8,095 males and 7,967 females in 2,507 households whereas Kembu Sub-district has a population of 11,613 people including 6,036 males and 5,477 females in 2,751 households (see tables 2 & 3 for a more detailed breakdown of this data).

3.1.1 LIMITATIONS OF THE POPULATION DATA

Although the data from this census is useful in indicating the size and gender breakdown of the target community, the validity of these statistics is weak. Government census data about sub-districts in a place like Jayawijaya must be treated cautiously because it is very difficult for census workers to collect data in remote and large sub-districts that have scattered populations and a very different culture to those who designed the survey and the data collectors themselves. WATCH staff experienced this need for caution when they worked on developing a better Health Information System (HIS). It appeared to them that in many instances the statistics sent by sub-district level census workers to the Indonesian Bureau of Statistics were guestimates or even fabrications. It has been suggested by some academics that a considerable percentage of the population of young adult males in Jayawijaya deliberately avoid being listed on the census¹¹. Although it is difficult to test, if this were the case in Kanggime and Kembu-Mamit then not only would the population be larger, but the male to female ratio would be even more skewed than in the 1996 data. The highly skewed sex ratios and practices of preferential female infanticide reported in some other parts of Jayawijaya¹² lend support to this idea.

We also need to be skeptical of the accuracy of government census data because they are collected in line with government defined categories such as grouping people according to *Desa* (administrative villages) lines. WATCH staff found that *Desa* boundaries in Jayawijaya rarely correspond with local patterns of social organisation and, in the absence of a strong government presence, the *Desa* structure holds little or no meaning for the local people. Similarly, collecting data about families according to the ideal of a nuclear family leads to invalid data in a region where nuclear families are rare indeed.

11 See Elmslie (1995).

12 See Godschalk (1992); Schiefenhoovel (1984, 1988 & 1989) & Butt (1994).

It is also unclear if the breakdown of population data according to household heads refers to the population of a *silimo* or to the members of a nuclear family. The average figures given appear to be too low to represent the population of individual hamlets / *silimos* when we compare them to Denise O'Brien's (1969) figures. She claims that individual hamlets / *silimos* are rarely home to less than 8 or more than 20 individuals. We must therefore conclude that the census data refers to individual families. However, it is possible that the survey team collected data based on a combination of nuclear families and hamlet populations. If this was the case then we would expect actual family sizes to be slightly smaller than that reported in the 1996 data. Alternatively, if the average family size had been concluded by counting the number of household heads (Kepala Keluarga) and dividing the population by this number, then we might expect that family size could also be underestimated as many Lani men are likely to describe themselves as family leaders, even if this is not really the case.

From this data it is also difficult to determine the ethnolinguistic mix of people living in the two sub-districts. Based on the data provided by the Summer Institute of Linguistics (SIL) Kanggime is entirely populated by Lani people (see section 3) whilst Kembu-Mamit has a mixed population comprised principally of Lani people but also including several Lowland Papuan groups. Based on SIL data we can estimate that the number of lowland Papuans who live or regularly draw sustenance from parts of the Mamberamo Basin in Kembu-Mamit is between 500 and 1,000 people. Yet in the 1996 census data it is unclear whether the nominal lowland Papuan population are included in the population data for Kembu-Mamit, whether they have been considered to be from Jayapura District, or even whether they have been recorded altogether. In any case it seems safe to presume that there are 11,000 or more Lani people and up to 1,000 non-Lani people living in Kembu-Mamit.

The lesson here is that it would be far more useful and meaningful for projects like WATCH to collect data according to locally appropriate social structures such as along the lines of confederacies and sub-confederacies, church parishes (which are themselves often based on the confederacy or sub-confederacy), and on hamlets and *silimo* (housing compound).

However, given that other estimates place the population of the entire Toli Valley watershed (including Karubaga Sub-district) at around 40,000 people (see Hayward 1992 p.10), a figure of 27,675 people living in Kanggime and Kembu-Mamit does not seem immediately unrealistic. In any case, this data is the most recent and reliable data available and, lacking any alternative, it has been used as the baseline population data for establishing health care coverage targets during the WATCH Kanggime extension.

TABLE 2. POPULATION DATA FOR KANGGIME SUB-DISTRICT

LOCATION BY DESA (OFFICIAL VILLAGE)	INHABITANTS	PERCENTAGE OF TOTAL POPULATION	MALE INHABITANTS	PERCENTAGE OF INHABITANTS MALE	FEMALE INHABITANTS	PERCENTAGE OF INHABITANTS FEMALE	NUMBER OF HOUSEHOLDS	AVERAGE NUMBER OF PEOPLE PER HOUSEHOLD	OUTSIDE AREA
KANGGIME	871	5.42%	446	51.21%	425	48.79%	172	5.06	49
NABUNAGE	1361	8.47%	700	51.43%	661	48.57%	276	4.93	49
KUPARA / PARARI	1782	11.09%	900	50.50%	882	49.50%	212	8.41	83
KUMBUR	1405	8.75%	685	48.75%	720	51.25%	182	7.72	96
WULUK	899	5.60%	450	50.06%	449	49.94%	104	8.64	80
NUNGGAWI	1407	8.76%	694	49.32%	713	50.68%	213	6.61	64
YALIWAK	1212	7.55%	644	53.14%	568	46.86%	202	6.00	61
PABA / PABANDO	834	5.19%	423	50.72%	411	49.28%	125	6.67	65
MARTELO / YITTELO	1280	7.97%	657	51.33%	623	48.67%	196	6.53	96
LUGUWI / ABERA	1052	6.55%	551	52.38%	501	47.62%	193	5.45	77
BOGONUK	1206	7.51%	521	43.20%	685	56.80%	195	6.18	67
KOKONDAO / YINGGUGA	1121	6.98%	565	50.40%	556	49.60%	202	5.55	109
EGONI	1632	10.16%	859	52.63%	773	47.37%	245	6.61	128
TOTAL	16,062	100.00%	8,095	50.39%	7,967	49.61%	2,517	6.38	1,024

Source : Sensus kecamatan Kanggime, BPS, 1996

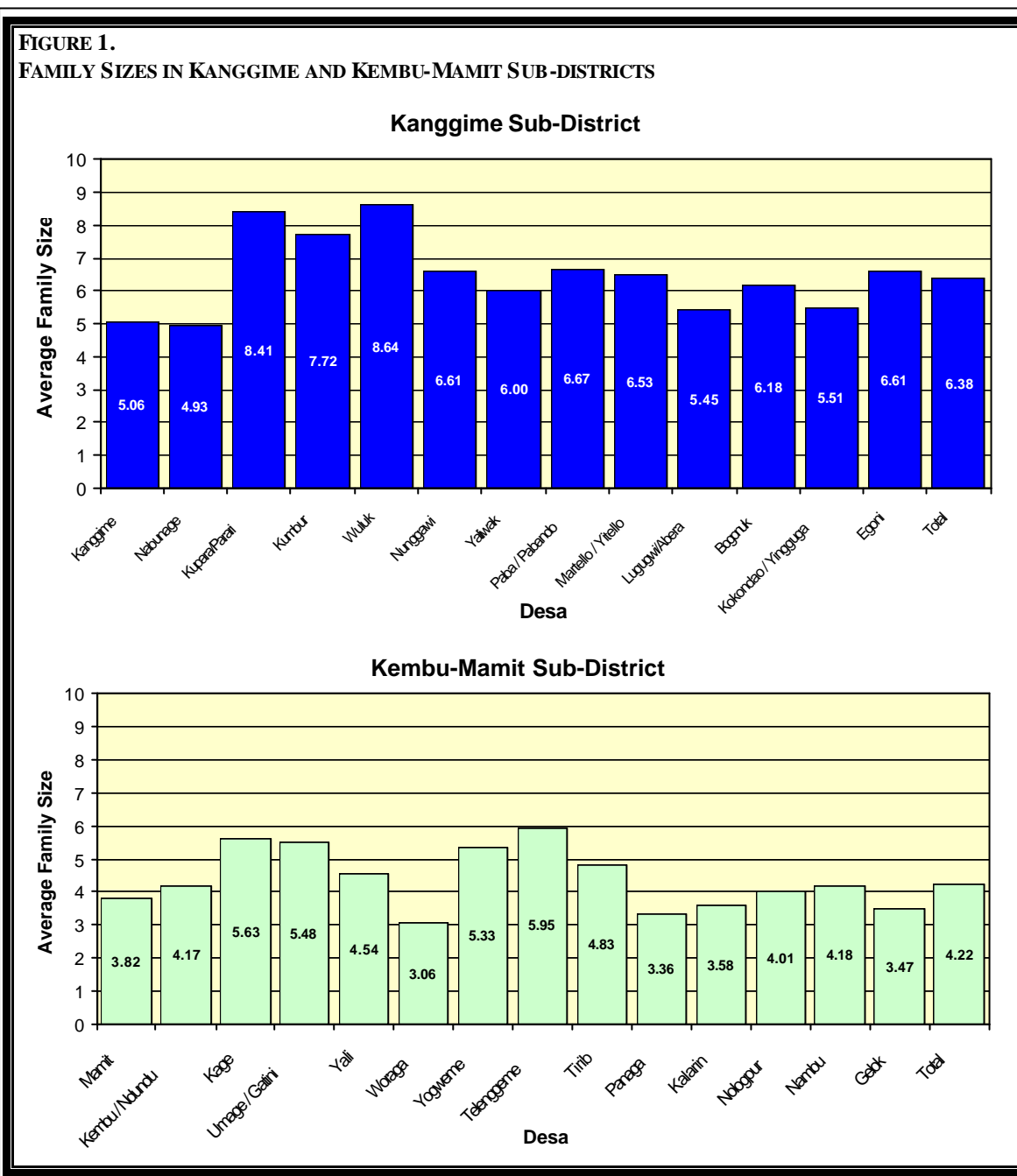
TABLE 3. POPULATION DATA FOR KEMBU / MAMIT SUB-DISTRICT

LOCATION BY DESA (OFFICIAL VILLAGE)	INHABITANTS	PERCENTAGE OF TOTAL POPULATION	MALE INHABITANTS	PERCENTAGE OF INHABITANTS MALE	FEMALE INHABITANTS	PERCENTAGE OF INHABITANTS FEMALE	NUMBER OF HOUSEHOLDS	AVERAGE NUMBER OF PEOPLE PER HOUSEHOLD	OUTSIDE AREA
MAMIT	1149	9.89%	622	54.13%	527	45.87%	301	3.82	
KEMBU / NDUNDU	647	5.57%	329	50.50%	318	49.15%	155	4.17	
KAGE	861	7.41%	430	49.94%	431	50.06%	153	5.63	
UMAGE / GATINI	767	6.60%	400	52.15%	367	47.85%	140	5.48	
YALI	1076	9.27%	541	50.28%	535	49.72%	237	4.54	
WORAGA	921	7.93%	492	53.42%	429	46.58%	301	3.06	
YOGWEME	932	8.03%	502	53.86%	430	46.14%	175	5.33	
TELENGGEME	785	6.76%	398	50.70%	387	49.30%	132	5.95	
TIRIB	783	6.75%	382	48.79%	401	51.21%	162	4.83	
PANAGA	720	6.20%	386	53.61%	334	46.39%	214	3.36	
KALARIN	758	6.53%	439	57.92%	319	42.08%	212	3.58	
NOLOGPUR	594	5.11%	298	50.17%	296	49.83%	148	4.01	
NAMBU	936	8.06%	470	50.21%	466	49.79%	224	4.18	
GELOK	684	5.89%	347	50.73%	337	49.27%	197	3.47	
TOTAL	11,613	100.00%	6,036	51.97%	5,577	48.03%	2,751	4.22	

Source : Sensus kecamatan Kumbu, BPS, 1996

3.1.2 FAMILY SIZES

An interesting trend emerging from this data is the disparity in average family sizes recorded for Kanggime and Kembu-Mamit Sub-districts. As can be seen from the data displayed in Figure 1, the recorded average family sizes for each *Desa* in Kanggime are almost always considerably higher than the average family sizes recorded for Kembu-Mamit.



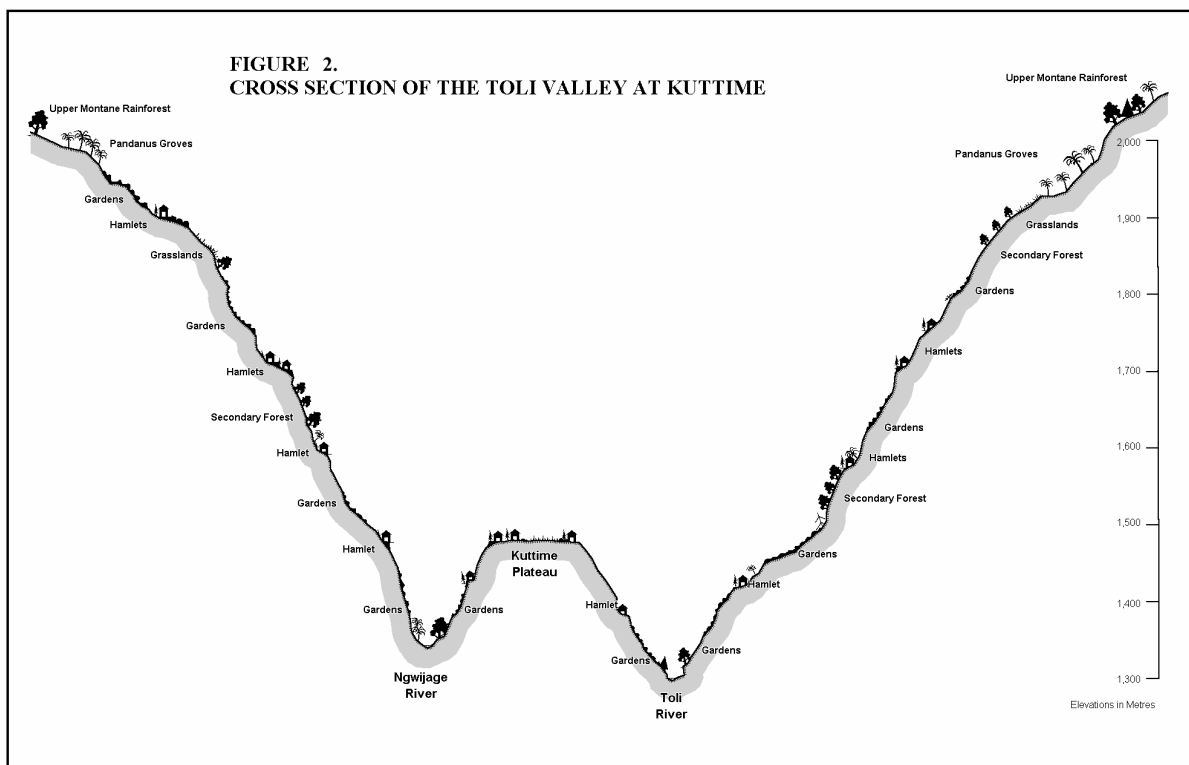
It is unclear whether this is a real phenomenon caused by environmental or social pressures or else is the result of erroneous data collection. In either case this situation is worth noting and in the future it may be worthwhile to investigate the reasons for a disparity in average family sizes as it may have implications for community development and family health oriented interventions.

3.2 SETTLEMENT PATTERNS

Based upon the 1996 census data it is difficult to establish a clear picture of the distribution of this population across the target areas. This is particularly the case when we consider that the exact locations and boundaries of many *Desa* in the two sub-districts, and particularly in Kembu-Mamit, remain unclear. However, based upon a combination of population data, information from secondary sources, field observations and knowledge of habitation patterns and constraints across Jayawijaya it is possible to estimate patterns of settlement in the target areas.

Apart from a few locations such as Kanggime, Mamit and Kembu, where a certain degree of nucleation of settlement patterns has occurred since the arrival of missionaries and government officers, settlement patterns across the two sub-districts remain quite dispersed.

The Lani live in small and scattered settlements know as *sili* or *silimo*. A *silimo* normally consists of one men's house (or *honai*), occupied by around 4-5 married and unmarried men, and several family houses (*ebai*) each of which is occupied by a married or widowed woman, her children and pigs and sometimes other relatives or friends. A number of *silimo* are usually found in fairly close proximity to each other and can be classified as a hamlet. The inhabitants of a hamlet are normally fairly close relatives and are likely to be able to work fairly closely together on specific tasks such as land clearing for gardens. The hamlets are usually fairly widely dispersed with quite extensive areas of gardens, fallow ground, forests and grasslands separating them.



The diagrammatic representation of a cross section of the Toli and Ngwijage River Valleys at Kuttme (see Figure 1) gives us some idea of the patterns of distribution of hamlets, gardens and forested areas in the Toli Valley Ecological zone.

If we consider settlement distribution across the whole of the two sub-districts we can see that the great majority of the population appear to be concentrated in the upper reaches of the Toli Valley and its main tributaries. With the exception of a few hamlets occurring in the lower parts of the upper-montane zone, all of the population in Kanggime would appear to live in this zone at altitudes of between 1,300 and 2,000 metres above sea level. In Kembu-Mamit at least half of the population appear to live in the upper Toli, Yal, Panaga and Ngika River Valleys, an area comprising only about 450 km² or around 13% of the sub-districts total area. The remaining 87% of Kembu-Mamit appears sparsely populated with some areas appearing totally uninhabited. Indeed it seems likely that less than 3,000 people might live in this area with around 1,000 people living around Yogweme on the mid to lower reaches of the Toli River, less than 1,000 living around Kembu and Ndundu and probably less than 1,000 Lowland Papuans living in the Mamberamo area.

4 LANGUAGE, CULTURE AND TRADITION

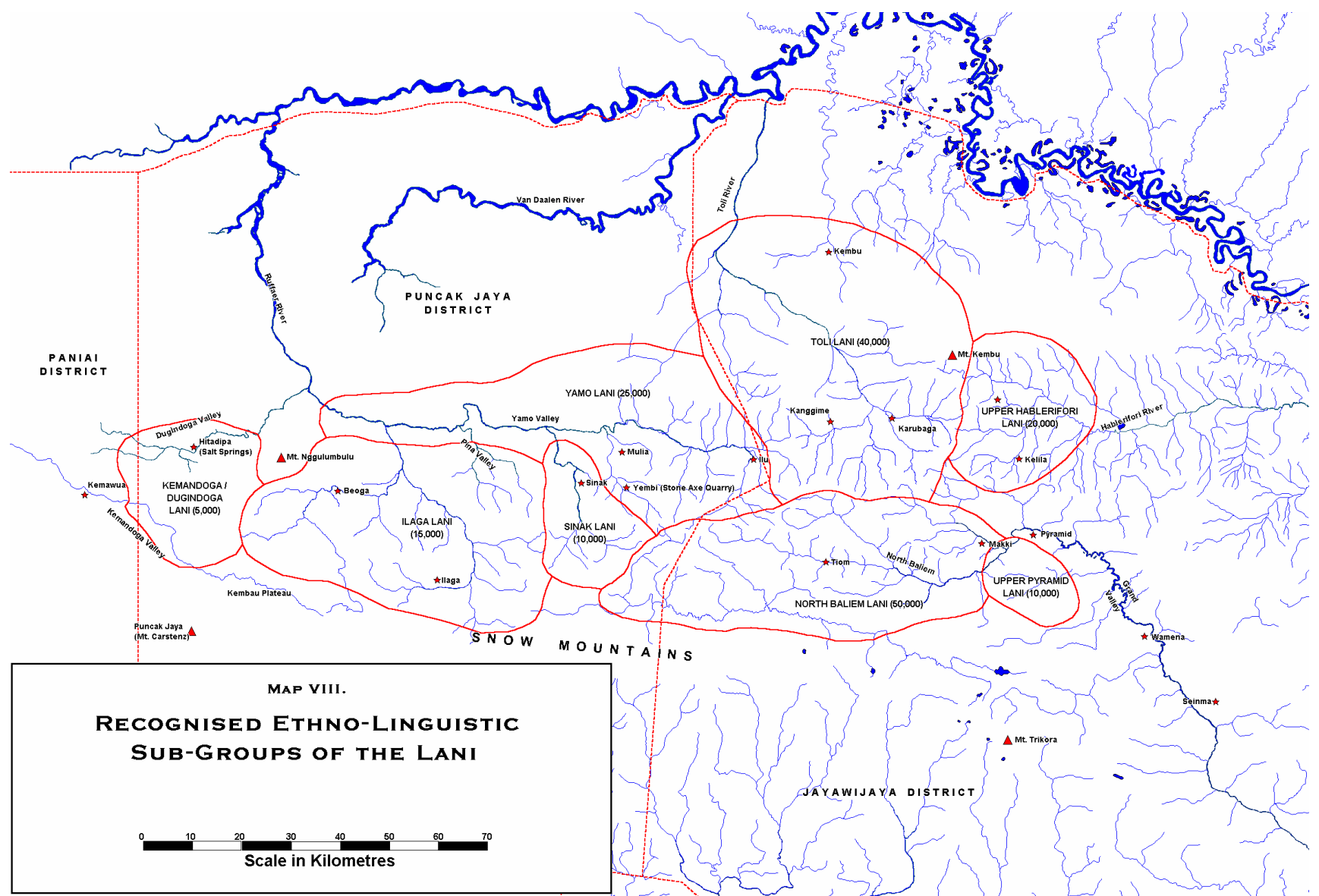
4.1 LANI / WESTERN DANI

The great majority of people living in Kanggime and Kembu / Mamit Sub-districts belong to the Lani ethnic and linguistic group. Until recently this ethnic group was known as Western Dani (*Dani Barat*) however, the Lani people themselves have increasingly applied the epithet Lani to their culture and this has now come into mainstream usage. The Lani constitute the largest cultural group in Irian Jaya with an estimated 180,000 people occupying an area of approximately 6,000 square miles between the Kemandoga Valley on the border of Paniai and Puncak Jaya Districts through to Pyramid and the western slopes of the Grand Baliem Valley in Jayawijaya District.

4.1.1 LANGUAGE

The Lani Language is a highland Papuan language and like many of the other languages spoken in Irian Jaya bears no resemblance to the Austronesian (Malay - Polynesian) languages spoken throughout most other parts of Indonesia and the Pacific. It is classified as being part of the Southern Dani Language Group, a group that also includes the Dani, Yali, Walak, Hubula, Nggem and Nduga languages of western Jayawijaya District as well as the Wano language in Puncak Jaya. Across the territorial expanse occupied by Lani communities there is a considerable degree of variation in the Lani language¹³ however the different groups can communicate with one another for purposes such as trade.

13 The Lani language is considered to consist of up to eight localized dialects (shown in Map. VIII) but of these, six are considered to be very similar with only the Upper Pyramid and Upper Hablifori dialects considered to be significant variants.



MAP VIII.

**RECOGNISED ETHNO-LINGUISTIC
SUB-GROUPS OF THE LANI**

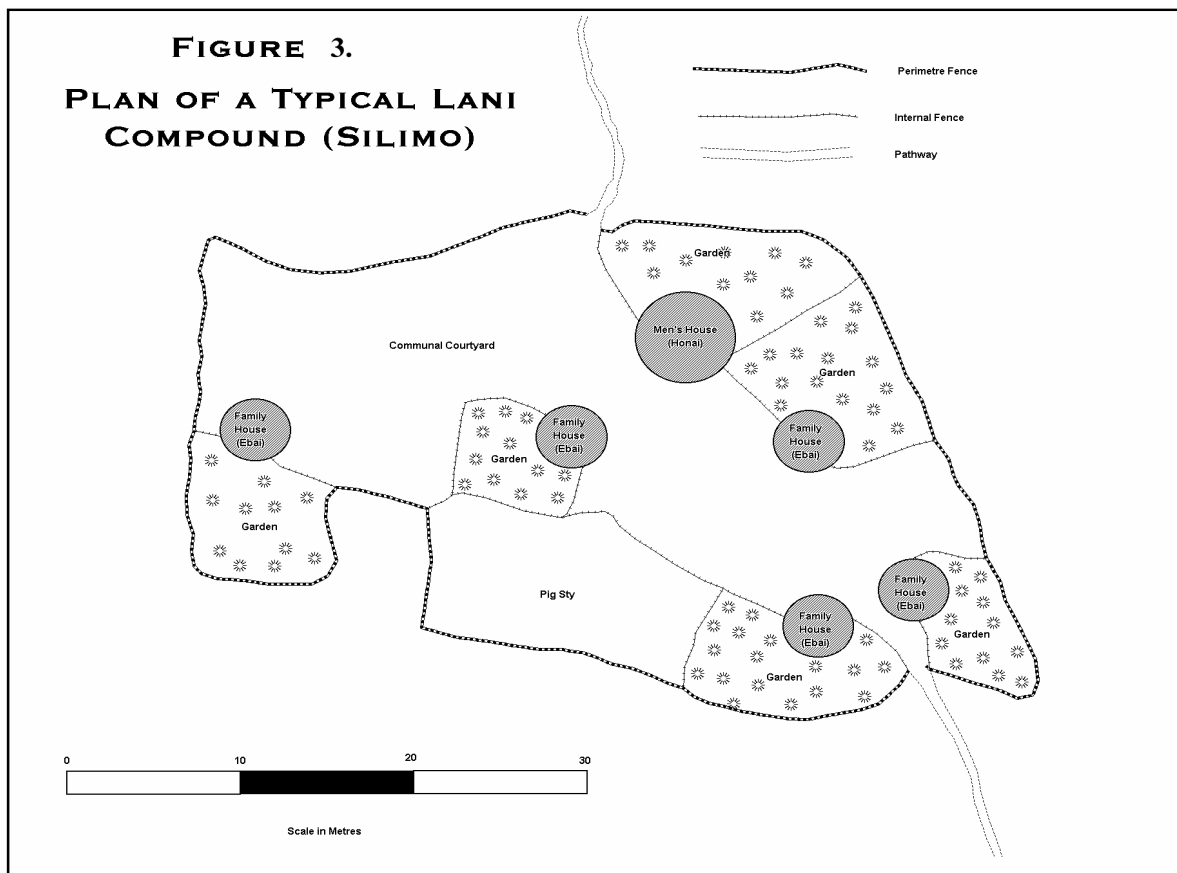
0 10 20 30 40 50 60 70

Scale in Kilometres

4.1.2 HOUSING

As mentioned in section II / 3.2, the Lani live in small compounds known as *sili* or *silimo*. Each *silimo* is made up of a men's houses or *honai* and a number of family houses or *ebai* all of which are situated around a communal courtyard and enclosed within a fence or palisade of split timber boards topped with grass (refer to Figure 2. below). The *silimo* is usually nestled in a grove of trees and small gardens are usually in or around it. There also may be a small pig run attached to the *silimo*. As these structures decay they will be repaired several times but they will ultimately be demolished and replaced with new ones. Consequently the relative positions of houses, fences and other structures within the *silimo* will change overtime and the gardens therein will be gradually rotated.

Several married men along with their wives, children and other relatives usually occupy a *silimo*. Across time the composition of a group residing in a *silimo* may alter, as individuals tend to move into other compounds as they wish. A group may also maintain several *silimo* at a time, as well as several outlying mountain huts, which are used by hunters and pandanus collectors. O'Brien (1969) states that of the *silimos* she observed in the Konda Valley, they were rarely home to less than eight people or more than 20. Whilst these figures roughly fit with the field observations made by WATCH personnel for the Upper Toli Valley communities, it is not wholly clear if such habitation patterns are valid for more peripheral communities living in the northern parts of Kembu-Mamit Sub-district. If we assume these figures are valid across the entire target area, we can roughly calculate the mean number of residents living in each *silimo* as 14 and the number of *silimos* occupied at any one time in Kanggime as being around 1,150. In Kembu-Mamit the number would be around 830.

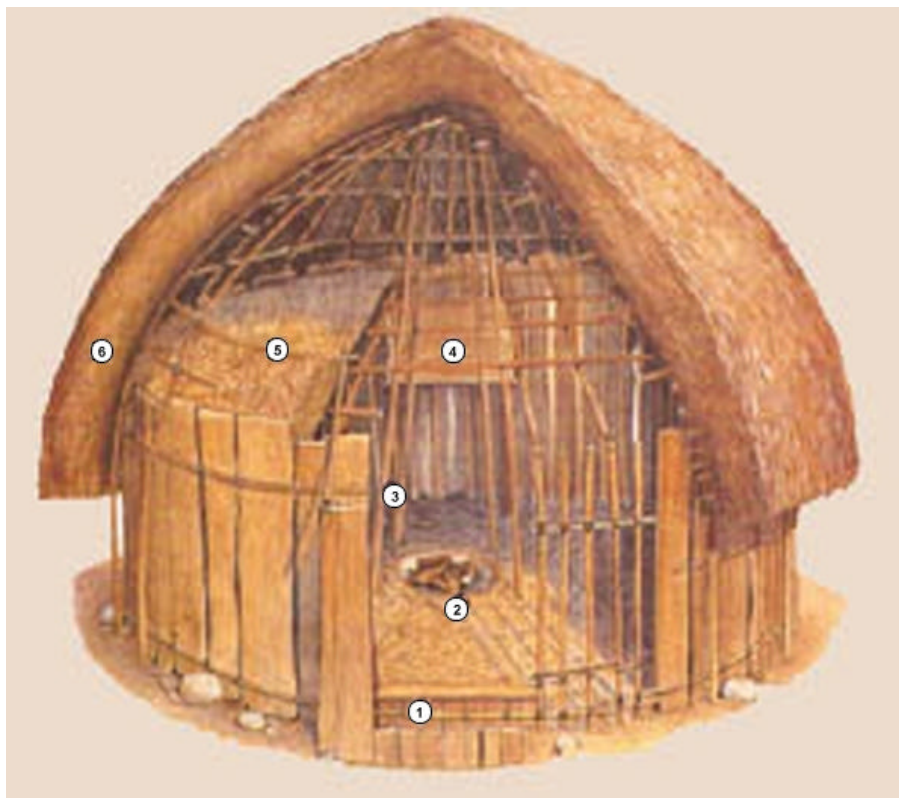


Adapted from Larson 1987

The men's houses or "*honai*" are constructed along a circular design with a high domed roof normally measuring 5 – 7 metres in diameter (see Figure 3). At the centre of these structures we can find four stout poles that have been driven into the ground at roughly 3 feet intervals and which gradually converge towards the roof's apex. These poles form the main support for the *honai* and also delineate the central hearth areas within. The walls are constructed from a double layer of closely spaced split planks that are driven upright into the ground. For additional insulation the cavity between the inner and outer walls is often packed with grass. The roof is constructed from a lattice of bent sapling wood that is covered by a thick thatch of alang-alang grass (*Imperata cylindrica* L).

There are two levels within a *honai*. The lower level is often dug out to a depth of about 20 cm and has a head clearance height of four feet or less. This area is primarily used as a place where men gather to talk but it is also used for storage, sleeping and occasional cooking. Built on a platform of poles and reeds that are level with the top of the structures, the upper level of the *honai* is a sleeping loft. Both levels have a hearth situated at their centre, flanked by the four main supporting poles. The hearth on the lower level is dug into the earth and has a rack for drying firewood directly above. The hearth on the upper level is made of baked earth and is set into the reed floor. This hearth is rarely used for cooking or heating but rather for the appeasement of ghosts or spirits who may visit the *honai* whilst men sleep. A small opening about 150 cm high by 100 cm wide is the only entrance to the *honai*. At night or when the *honai* is unattended this entrance is blocked with boards or sheets of bark.

FIGURE 4.
CUT-AWAY DIAGRAM SHOWING LANI MEN'S HOUSE (*HONAI*) CONSTRUCTION



1. Entrance Antechamber
2. Lower Hearth
3. Centre Poles
4. Upper Hearth
5. Sleeping Loft
6. Thick Thatched Roof

Source: Adapted from Indonesian Heritage Online Encyclopedia

The family houses or *ebai* are almost identical to the *honai* except that they are smaller (around four metres in diameter) and they often have a slightly raised platform of poles and reeds as a floor in the lower level. The use of floors in family houses seems to be related to Highland Papuan ideas of dangerous polluting effects related to female bodily excretions. The *ebai* are also often built with a second doorway, which O'Brien (1969) posits functions to prevent men from being trapped in the family house if there is a sudden attack. One or more small stalls where pigs can be restrained overnight also occasionally constructed inside the *ebai*. Hunting huts in the mountains are built in a similar manner except that their roofs are normally constructed from pandanus leaves of bark shingles.

The close construction of the walls, the thickness of the thatching, the absence of chimneys or windows and the fact that the only doorway is a small opening entails that these buildings are extremely efficient in terms of trapping heat from the small fires within. Whilst the efficiency of houses in trapping heat is important during cold Highland nights, the downside to this design is that it traps a lot of smoke. Therefore, this design is considered to significantly contribute to the high incidence of pneumonia and other respiratory diseases in the highlands¹⁴.

During the first phase of the project, WATCH attempted to reduce indoor air pollution by promoting the use of smoke free stoves as well as houses that had better ventilation. To this end WATCH developed several demonstration healthy houses in the areas of Pitt River, Kelila, Makki, Tiom and Wamena. Their work found parallels in government initiatives to promote healthy houses across Jayawijaya. These approaches were subsequently abandoned as it became apparent that the local communities were extremely resistant to new architecture and cooking technologies. The new housing designs were considered to be cold and dark, and they failed to fulfill other social needs. Furthermore in the sub-district of Ok Sibil, the only area where large numbers of local people have adopted 'healthy houses', the lack of smoke has been linked to an increased number of anopheles mosquitoes and consequently to an increased rate of malaria.

4.1.3 DIVISION OF LABOUR

The foraging and horticultural subsistence tasks of the Lani are traditionally divided into men's, women's, girl's and boy's duties. The task of clearing and burning primary or secondary growth to make way for new gardens is strictly men's work as is building fences around gardens and *silimos* and the construction or repair of houses. As is typical in many highland Papuan communities men are responsible for the cultivation of a range of prestigious crops including nut Pandanus (*P. brossimos*) the red fruit pandanus (*P. julianetti*), *colocasia* taro, sugar cane and bananas. Men will also work together on community projects such as the construction and maintenance of church facilities or in clearing land for social activities. They also do the bulk of firewood cutting. Men produce a range of handicrafts including shell bands, polished *jao* stones as well as various forms of body decoration and weapons such as bows, arrows and spears. Men's work is often sporadic but arduous and they often spend their days involved in the discussion or pursuit of political and social concerns.

14 For more information on the significance of indoor air pollution as a contributing factor in the high incidence of respiratory tract infections in Jayawijaya refer to Vriend (1999).

Women are responsible for planting, weeding, harvesting, and cooking most of the family's food. They are in charge of intensively caring for children and for pigs. Caring for pigs involves herding them into their quarters, building fires for them and feeding them in the evening. Baby pigs follow the women around like puppies but there are no reports of Lani women breastfeeding pigs, as has been reported for some other highland Papuan groups. The work of caring for babies and infants is shared with older children, especially girls and older people who remain in the villages throughout the daytime. Women are responsible for much of the heavy carrying work in Lani society. O'Brien (1969) estimates that they carry an average of about 15 kgs of sweet potatoes home from the gardens each day to which may be added the weight of tools, firewood, other produce and infants. Despite this, in comparison to men's work women's work tends to be less arduous but requires constant attention. As they use their gardens as living larders and do not maintain large stocks of food in the home, women have to travel to their gardens almost every day. In case of illness or other engagements they can draw upon reserves of sweet potatoes grown in the hamlet gardens or they may request close relatives or affines to collect additional sweet potatoes for them and their families evening meal. Women produce the string bags that they use to carrying everything from sweet potatoes to children and that are an essential part of the Lani woman's dress. At almost any time that a Lani woman is not involved in other work you will find her occupying her fingers with the winding of bark string to weave string bags.

At a very early age boys begin to form teams to hunt birds and other small game. By the time they are about eight years old they also accompany their fathers to clear land, cut firewood and hunt. Their fathers also teach them to set traps for forest mammals. Young girls work with their mothers in the gardens, mostly caring for younger children. If a mother needs to nurse a baby or rest the older daughter, niece, or younger sister will take over the digging stick. The collection of cooking and drinking water is usually delegated to young boys or girls, though most Lani drink water only sparingly and they prefer to replenish themselves by eating cucumbers. Whilst men have primary responsibility for the cutting of firewood, women and their children collect smaller sticks on the way home from their daily activities and women often carry larger bundles of firewood that have been prepared by men to the hamlet.

4.1.4 SOCIAL STRUCTURE

Lani society is structured according to eight kinship categories that are described below (O'Brien 1969; Larson 1962; Ploeg 1966; Hayward 1992) and conforms to a dualistic structure whereby most social groups consist of two opposite but complimentary sub-groups. Whilst membership of these social groups is principally determined through a combination of blood (cosanguineal) and marriage (affinial) ties, Lani communities display a considerable degree of social fluidity. People from outside a particular kin group can be easily incorporated into the group by taking up common residence within that group.

A. Moieity

At the broadest level Lani society, like most neighbouring ethno-linguistic groups, is broken into two exogamous (out-marrying) groups. These two groups cut within and across ethno-linguistic groups. That is, Lani people share the same moiety system with the Grand Valley Dani, Yali, Damal, Dem, Wano, Nduga, Walak, Hubulah, Nggem and Silimo people. These moieties are known by a range of different but obviously related names including *Wonda* and *Weya* in Ilaga (Larson, 1962: 33), *wenda* and *weya* in Bokondini (Ploeg, 1966: 264) and *Wita* and *Waiya* in the Grand Valley (Heider, 1965: 211).

In at least parts of the Toli Valley Lani population there is some doubt regarding the existence of moieties. In the Panaga Valley community he studied, Wirz records the existence of moieties called *Wenda* and *Woya* (Wirz, 1924, p. 47) however Denise O'Brien claims that despite considerable effort to clarify the issue of moieties, she could find no evidence of the existence of moieties amongst her informants around the Karubaga and Kanggime areas (O'Brien, 1969, p. 178).

B. Clan and Lineage

The next largest social unit in Lani societies is the *anebinu* or clan. Members of a clan believe they are all related through paternal ancestors even though it is not possible to trace links between individual members. While some clans are restricted to a few valleys, in general clans are not localized. Some, such as the particularly large "*Kogoya*" clan, are spread across the entire Lani territory. Lani people are largely ambivalent about members of their clan living in different geographical regions even though they recognize their shared ancestral bonds. For example, O'Brien reports that whilst the clan is ideally exogamous (out marrying), marriages do occasionally take place between members of the same clan so long as the bride and groom come from different areas and have no known genealogical link exists. Names of Lani clans often relate to animals or plants yet clans are not strongly totemistic, that is they do not strongly believe in close kinship with animals or plants.

O'Brien claims that of the roughly 75 different Lani clan names, twenty were represented in her study area, with sixteen of these having a substantial membership of over one hundred people (O'Brien, 1969: 183-184). There is no data available regarding the representation of Lani clans in Kanggime and Kembu-Mamit. It does seem likely though that around 40 clans may be represented in the area. From other data collected by the WATCH team it appears that the clans with the largest membership in the target areas are *Kogoya*, *Wenda*, *Weya*, *Wonda* and *Wanimbo* followed by the *Gire*, *Tabuni*, *Murib*, *Gurik*, *Narek*, *Wanena*, *Tabo*, *Penggu*, *Yikwa*, *Bogum*, *Wakur*, *Bembok* and *Enembe* clans.

From the perspective of a community development planner, the clan has little practical significance. Clans exist more as an ideal rather than as functional social units. On the other hand, lineages within the clan are quite important as they form the main building blocks for the sub-confederacies, confederacies and alliances described below and because the ownership of land in Lani society is held corporatively by individual lineages.

C. Confederacies, Sub-Confederacies and Alliances

The *confederacy* is the most important socio-political unit in Lani society and is the basis upon which church parishes have been established. The confederacy itself is made up of two sub-confederacies each of which is largely comprised of people who belong to several lineages in a single clan. The members of each sub-confederacy will occupy contiguous housing compounds / *silimos* with the two halves of the confederacy usually living in one or two paired but distinctly separated settlements. The confederacy is ideally endogamous, with the women of one sub-confederacy marrying men from the other. War should never break out within a confederacy, though domestic disputes are common and confederacies have been known to split over irreconcilable grievances.

Because the *sub-confederacy* is usually the largest unit that can be brought together to form work teams, community development activities that require groups should work at the confederacy / parish level. Even though the term *eegu* refers to the confederacy in the Toli Valley, it is a term rarely used by local people who prefer to refer to the combined names of their two major component clans, such as *Wonda-Kogoya*, *Yikwa-Wanimbo* or *Bogom-Wandik*.

The *alliances* were relatively temporary and shifting social structures, though sometimes alliance arrangement between different confederacies might last for decades. Alliances are established for mutual defence or aggression against neighbours. Since the cessation of tribal warfare during the early 1960s, the alliance has become a largely defunct social structure though it clearly remains quite viable for Lani communities to re-establish alliances if the desire or opportunity arises.

Once again we do not have access to the details of confederacies and sub- confederacies in Kanggime and Kembu-Mamit. By analysing settlement patterns and church parishes however, we can roughly estimate the membership of sub-confederacies and confederacies in the target areas. With regards to the latter, since the 1960s parishes have been built upon pre-existing confederacies, and also because we can make rough estimates in the field based on local settlement patterns.

D. *Silimo* / Extended Family

As has already been described in section II / 4.1.2, the *silimo* is the Lani housing compound which comprises a men's house, several family houses and has a population which is normally between 8 and 20 individuals. *Silimos* house several married men, all of whom should ideally belong to a common lineage, their wives, who are ideally drawn from the lineages in the opposite sub-confederacy, and their offspring, who are considered part of their father's lineage. However, it is also common to find several unmarried men as well as a number of older relatives or affines living in the *silimo*. It also appears quite common to find totally unrelated individuals or families in a *silimo* and, over time, these individuals can become incorporated into the residency based kin group. Therefore, inclusion within the group is not strictly limited to cosanguineal (blood) or affinal

(marriage) relationships. Ideally, a new wife takes up residence at her husband's *silimo* yet this rule is flexible as men may take up residence in the *silimo* of his wife's parents. However, the latter is normally a temporary arrangement caused by the husband's inability to complete marriage exchange obligations. Therefore, the *silimo* community can be described as a kind of extended family, which often pools its resources and strongly discourages any use of violence in internal conflict resolution.

Whilst several men within each *silimo* are recognized as the heads of their own families and decision making within the *silimo* group is largely based on consensus, there is normally one man within the group who is considered to be the overall leader of the *silimo* and his leadership is constantly negotiated. Several contiguous *silimos* will normally be occupied by the male members of a single lineage and their wives in what might be described as a hamlet.

It should be noted that in a *silimo* the male inhabitants strongly value consensus and harmony but female inhabitants value them less so. This probably results from the fact that most women in a *silimo* are drawn from a number of different *silimos* and placed together in a social environment where they have limited political power or access to mediation by blood relatives. Consequently, relations between women living in a *silimo* can range between high levels of cooperation and friendship through to open antagonism. Women can often find themselves a target of sorcery accusations or blamed for the misdeeds of other residents.

E. Nuclear Family

The concept of the nuclear family, which is quite strong throughout much of western and central Indonesia as well as most western countries, is of quite limited relevance to Lani societies.

The popularity of the nuclear family as an organizing structure is limited due to several aspects of Lani society. Firstly Lani men often marry multiple wives (polygamy) and have several sets of offspring. This obviously limits their capacity to play an active role as the head of each of these families. Since the arrival of missionaries there has been a rapid decline in the rates of polygyny and an increase in nuclear family values (Hayward 1980), however polygyny still does occur amongst most Lani communities and the traditional role of the polygynous family head probably continues to be an ideal for many more Lani men. Secondly, fathers have limited opportunities to interact intimately with their wives and children because life amongst the Lani is strongly sex segregated. Furthermore, men are motivated to maintain the separate gendered realms to avoid being burdened with an increased responsibility for the well-being of their wife and children.

The lineage is too strong and functional a unit to be swayed by ideals of the nuclear family. For instance Lani children refer to most male members of their lineage as 'father' and children seem to be considered a continuation of the lineage as opposed to being a continuation of the individual.

A word of caution is needed. Close links between a husband, wife and their immediate offspring do exist but this relationship is only part of a broader social network. The relationship between a child and its maternal

uncles and paternal grand parents are valued very strongly. In Lani society, the mother most resembles the head of a nuclear family as she maintains principle responsibility for the well-being and upbringing of all her children at least until the age of seven or eight. At the same time, both a child's father and his/her mother's brothers maintain certain social rights and obligations towards the child and take increasing responsibility for the children, particularly for male children after they reach the age of seven or eight. It should also be noted that realities in the field can deviate from these ideals. Like all societies one can find fathers who dote on their children taking them (male or female) with them as they go about their daily work, or fathers who seems to abjure almost all responsibility towards their children.

4.1.5 CARGO CULTS OR ACCULTURATION MOVEMENTS & SOCIETAL INTENSIFICATION

Cargo cults or acculturation movements are a phenomenon of particular significance to those working on development projects in Irian Jaya. In various guises acculturation movements have emerged in many New Guinean societies¹⁵ including amongst the Lani. The missionary ethnographers Ellenberger, Hayward, Larson and Godschalk have all provided descriptions and analysis of what they call the *hai* cargo movements of the Damal and the *nabelan-kabelan* cargo movements of the Lani¹⁶. Douglas Hayward's account of cargo movements of the Lani with particular reference to the Mulia Lani, has been reproduced as Annexe III of this document. It contains useful information both for development planners, practitioners and sponsors and also for government policy makers, particularly given the current economic and political problems being experienced in Indonesia and Irian Jaya.

These accounts by missionary ethnographers, although rather self-apologetic or self-aggrandising, provide valuable historical information about acculturation movements in certain Lani communities. The accounts all share the theme that the Lani are seeking to redress imbalances between their lives and the lives of wealthy outsiders. Through their beliefs and behaviours the Lani are attempting to establish equal relations with outside groups, such as missionaries, the representatives of the national government, foreign nations or development workers and projects in order to establish an idyllic and eternal life.

There have been secular ethnographers too who have written about the differences between Grand Valley Dani and Lani communities in relation to their willingness to change and incorporate new ideas and technologies. From this work that was done in the 1960s, a theory has emerged attributing the Lani to have greater receptivity towards new ideas and technologies because of a phenomena Ploeg (1969) refers to as societal intensification due to environmental stress. By this he refers to the fact that Lani communities tend to display a number of cultural traits that appear absent in the closely related Grand Valley Dani cultures. Such traits include a much greater openness towards innovations, an intense concern about female sorcery and other types of spirit attack, and a much greater tendency to develop what are often referred to as cargo or acculturation movements. This theory posits that the Lani, having only recently left the fertile and relatively disease free

15 The most famous accounts of cargoism in Melanesia include Burridge (1960), Lawrence (1964), and Harding (1967).

16 For accounts of cargo movements amongst the Lani and neighbouring groups refer to Hayward (1992), Larson (1987), Godschalk (1989a, 1989b, 1989c, 1993), Ellenberger (1983) and Hitt (1962).

Grand Valley, still expect to maintain the kind of affluent life style and social structure that they or their recent ancestors enjoyed in the Grand Valley however their new environment cannot sustain the level of agricultural surplus required to maintain previous levels of ritual, exchange and trade. As a result Ploeg believes that the Lani suffer social stress that can manifest both as acculturation movements and as cycles of warfare and witch-hunting.

The main implication of these ideas for development projects like WATCH is that apparent success in the acceptance of new ideas and technologies may be deceptive. Perhaps local enthusiasm for development interventions relates to acculturistic behaviour rather than the development of the groups capacity to make informed development choices. Furthermore as quantitative monitoring techniques will only measure rates of application they are not effective in detecting these nuances.

4.1.6 SPIRITUAL & MEDICAL BELIEF SYSTEMS

An understanding of the belief systems of the target community is essential in any PHC project. Because they determine the ways that development messages are interpreted and accepted, it is important to frame project interventions to 'resonate' with the belief systems in any target community. However, for two main reasons it is difficult to access information on the belief systems of the Toli Valley Lani.

Firstly, because the Lani are a non-literate society, who maintain and renew their belief systems through an entirely oral tradition, one cannot simply refer to an authoritative text, which codifies their beliefs. Even when outsiders have attempted to record their beliefs, their texts cannot be considered as definitive since such stories and explanations of cultural beliefs vary considerably between individuals as well as over time.

Secondly, the Toli Valley Lani are likely to be both selective and guarded in what they tell outsiders. While many have converted to Christianity, pre-Christian beliefs may still be held yet not expressed for fear of being perceived as ignorant and sinful. This is not to say that the Toli Valley Dani are hiding their 'true' beliefs for throughout its history Christianity, as well as most other major religions, has proven hardy in its ability to fuse with and thrive alongside pre-existing beliefs.

WATCH staff preferred to rely extensively on books, theses and articles to establish an overview of Lani belief systems and practices. This prevented too many project resources being used to investigate local belief systems. Where they needed to investigate specific points of relevance to the projects goals staff have used techniques such as group discussions, surveys and direct observation.

Gordon Larson and Douglas Hayward provide the most extensive accounts Lani belief systems. Their work is a particularly rich description of cosmological and other beliefs of respectively, the Ilaga and Mulia Lani. Furthermore, both authors (but Hayward in particular) have attempted to codify Lani cosmologies into a holistic package. Whilst this codification can provide us with a relatively comprehensible model (see Annexe IV), as a model we must keep in mind that it is a rigid abstraction from people's daily lives.

Denise O'Brien (1969) gives us the most thorough account of belief systems amongst any of the Toli

Valley Lani communities. Doing research in Karubaga shortly after missionisation began, O'Brien describes the need to mitigate misfortune and ward off death as being central to Lani life:

“No death, with the occasional exception of a very old person, is regarded as natural or inevitable. Each death has a specific supernatural cause, which can be traced to the actions of a witch or sorcerer or to the intervention of ghosts or spirits. Even deaths in war were considered to be influenced by the action of ancestral ghosts, and of naturally occurring spirits. The central role played by death in the pre-contact religious system is one factor which made it possible for the Lani to abandon relatively quickly (within four years) their traditional beliefs and experiment enthusiastically with Christianity which offered material aid against death in the form of pills and injections, and promised a wondrous personal immortality as well, which appears to have been interpreted quite literally by the Lani.” (O'Brien, 1969:88-89)

The work of Karl Heider (1970), Herman Peters (1975) Lokobal (1991, 1997) and Leslie Butt (1998) amongst the Grand Valley Dani, John Ellenberger (1983) amongst the Damal in Ilaga and Beoga and Ien De Vries (1988) also provide material that is useful to contextualise the accounts of Hayward, Larson, O'Brien and Ploeg. Whilst it is not appropriate to present their major ideas in this report, their work is extremely important as baseline information for those working with Lani communities. Tabulated information about Lani cosmological beliefs and spirit typologies (with special reference to disease associations) is provided as additional reading in Annexe IV of this report. The following section is a brief discussion about one aspect regarding local beliefs, female sorcery. This phenomenon has particular significance to WATCH and other Development Projects attempting to work with Lani communities.

4.1.7 HIGH INCIDENCE OF FEMALE SORCERY

One of the most interesting findings of Denise O'Brien's work and one that is supported by the work of Ploeg, Larson and Hayward, in the early 1960s when she was doing fieldwork, the Konda Valley Lani displayed an extremely high incidence of female sorcery accusations. Earlier last century, the anthropologist Evans-Pritchard established the difference between sorcery and witchcraft during time spent amongst the Azande people of Africa. Witches are people that "...can injure (others) in virtue of an inherent quality. A witch performs no rite, utters no spell and possesses no medicine. An act of witchcraft is a psychic act". On the other hand "sorcerers may do (others) ill by performing magic rites with bad medicines" (Evans-Pritchard, 1937:21). Broadly speaking then, witchcraft is unconscious whereas sorcery involves a conscious effort to harm others.

Denise O'Brien found that Lani people in Karubaga and Kanggime recognized four types of magically empowered people. Two were considered relatively benevolent, and two had powers that were feared. The relatively benevolent spiritual practitioners in the Toli Valley were the *ap endage bor* or male shamans and female curers. The malevolent types include the *magidak* or female sorcerers who were not spirit possessed but use various types of symbolic poisons to invoke attacks by what are called *magidak* or *niggirak* spirits as well as the *Kugidowo* who were male witches said to be possessed of *Jongolak* spirits from the Ilaga Valley and who would kill by psycho-spiritually devouring the souls of their victims.

Of interest to O'Brien was that the gender roles of witches and sorcerers in the Toli Valley and amongst the Lani in general were reversed. In other societies witchcraft is more likely to be associated with women and sorcery with men. However in the Toli Valley witchcraft accusations were directed at men whereas sorcery was considered to be the exclusive domain of women. Whereas witchcraft accusations were not common, no woman was immune to being accused of sorcery if a death occurred in her neighborhood. O'Brien describes the Konda valley communities as being intensely preoccupied with and fearful of female sorcery:

"In relation to their fellow men, shamans and curers are generally benevolent and provide useful services, while witches and sorcerers are malevolent. Of course witches can be hired to perform a service and in such cases may be viewed as being benevolent by their clients, if not by their victims. Sorcerers differ from the other three types in being apparently unavailable for hire. Sorcerers act as a result of intensely personal motives rather than from the desire to earn a fee by performing a service for a client. An interesting correspondence is seen in the fact that Lani persecute and, if possible, kill suspected sorcerers but witches are apparently never attacked. People rarely expressed a fear of witches and it seems as if they are regarded as dangerous but useful. Witches are few and their identities are known. The very unpredictability of sorcery created fear of it and the need to attempt to control it by killing suspected sorcerers. Perhaps Lani belief in and fear of sorcery persisted despite the erosion in other areas of traditional ideology because unforeseen death still existed despite the confusing Christian idea of "eternal life," and death had to somehow be explained and combated." (O'Brien, 1969: 87 – 88)

Interestingly, while similar observations have been made for Lani communities in Bokondini, Ilaga and the Yamo Valley, female sorcery does not seem to be a major preoccupation amongst either of the Lani's major neighbors, the Grand Valley Dani (Heider, 1970) or the Damal (Ellenberger). The disparity of beliefs between such closely related and often intermingled ethnic groups has been described as a manifestation of Ploeg's theory of societal intensification due to environmental stress (see section 4.1.5). In light of Ploeg's idea, the high incidence of sorcery accusations against Lani women is a form of scapegoating. Women have come to be blamed for the higher rates of mortality and the decreased levels of agricultural surplus experienced by Lani groups after they were forced out of the Grand Valley region.

Ien De Vries (1988) suggested that the desire of Lani women to free themselves from the threat of being accused of sorcery, both by raising levels of agricultural production and reducing mortality rates, has been one of the main factors driving the rapid rate of acculturation amongst Lani communities. This analysis underscores the point that gender relations amongst the Lani are of concern as if these societies have a propensity towards such beliefs, the lives of Lani women may be endangered. Furthermore, De Vries' idea about "the mediatory role of Lani women and sorcery in cultural change" supports WATCH's view that despite their lack of social authority or power, women are important change agents within Lani society. Their willingness to try out novel ideas and technologies is motivated not only by their closer attachment to their children, but also through fear of a sorcery accusations being directed against them should the community suffer from disease, poor harvest or unmet aspirations of wealth.

4.2 DOUTAI, WARI, KAIY, TAWORTA AND WESTERN DUVLE

Beside the Lani, there are another five distinct ethnolinguistic groups reported to live in or around the edges of Kembu-Mamit Sub-district. These include:

1. The Doutai (or Tolitai), who are believed to number around 350 people and live along the lower reaches of the Toli River;
2. The Wari, who are believed to number around 300 and live around and to the north of the village of Taive;
3. The Kaiy, believed to have a population around 250 and live around Kaiy on the northern bank of the Rouffaer River but whose territory presumably extends well into Kembu-Mamit Sub-district;
4. The Taworta, who are believed to number around 150 and live mostly in the neighboring Bokondini Sub-District; and
5. The Eastern Duvle who number around 500 and live along the lower reaches of the Van Daalen River in Puncak Jaya District but whose territory also extends into what is nominally considered Kembu-Mamit Sub-district.

All of these groups are part of the lowland culture complex of the Mamberamo Basin. Whilst nominally located within Kembu-Mamit, as these groups are mostly serviced and administered from Jayapura District, none of these groups were specifically targeted by the WATCH Kanggime Extension.

5 LOCAL GOVERNMENT AND ADMINISTRATION

The administrative / government structure applied to the sub-districts of Kanggime and Kembu / Mamit is the same structure applied right across the Republic of Indonesia. This structure is made up of five main hierarchal levels as shown below.

TABLE 4. GOVERNMENTAL / ADMINISTRATIVE LEVELS IN INDONESIA

	GOVERNMENTAL / ADMINISTRATIVE LEVEL		GOVERNMENTAL / ADMINISTRATIVE HEAD	
	ENGLISH	INDONESIAN	ENGLISH	INDONESIA
1	National	Negeri	President	Presiden
2	Provincial	Propinsi (DATI I)	Governor	Gubernur
3	District	Kabupaten (DATI II)	-	Bupati
4	Sub-district	Kecamatan	Sub-District	Camat
5	Village	<i>Desa</i>	Village Head	Kepala <i>Desa</i>

5.1 KECAMATAN / SUB-DISTRICT LEVEL GOVERNMENT AND ADMINISTRATION

Kanggime and Kembu / Mamit are both Kecamatans or Sub-Districts within Jayawijaya District. They do not operate as autonomous administrative regions but as sub-units of the government of Jayawijaya District. They are headed by the Sub-district head or Camat who is appointed by the Provincial Governor on the recommendation of the District Head (Bupati). The Camat acts as the representative of the Bupati at the Sub-district level. The Sub-district Government has powers and responsibilities in the fields of government, security and public order, guidance of the people, community welfare, local economy, community development, tax collection and finance and administration. In theory the Camat should be assisted by a staff of eight or more administrative personnel. In practice it is very difficult to maintain a full complement of qualified staff in Sub-district offices especially in remote and underdeveloped areas like those found throughout the interior of Irian Jaya. Having been established only very recently and during a time of severe economic downturn and social turmoil, government offices in Kanggime and Kembu-Mamit are poorly resourced with only a couple of government officers located in each.

The Camat and his staff are considered to be part of the Department of Internal Affairs. This department is responsible for governance and administration at the National, Provincial and District levels. The Camats Office does not have jurisdiction over the sub-district and village level health services, which are part of the Health Department and are administered by the District Health Service, or the local schools, which are part of the Department of Education and Culture and are administered by the District Education and Culture Service. However, the close proximity of these three services in isolated areas often leads to a high degree of cooperation between these services and a high level of penetration of Kecamatan staff into other activities. Unfortunately, due to the extreme human resource crisis in the Kanggime and Kembu-Mamit sub-district administrations, such cooperation is lacking.

5.2 DESA / VILLAGE LEVEL GOVERNMENT AND ADMINISTRATION

Kanggime and Kembu / Mamit Sub-districts are in turn made up of a number of *Desa* or Administrative Villages. In Kanggime Sub-district there are 13 *Desa* whereas in Kembu / Mamit Sub-district there are 14 *Desa*. Each of these *Desa* is headed by the *Kepala Desa* or Village Head. From a list of names identified in popular elections, *Kepala Desa* are nominated by the Bupati and appointed by the Governor.

According to the ministerial regulations governing the structure of the Village level administrative units (*Peraturan Menteri Dalam Negeri 1/1980*) the minimum required structure should include a Governance Unit, Development Unit and Administrative Unit whilst the maximum structure would also include a community welfare unit and a finance unit. Each of these units should be staffed by one person appointed by the Bupati on the recommendation of the *Kepala Desa*.

The powers and responsibilities of the village level administration include the keeping of village statistics,

planning of village activities, planning and administration of local development activities as part of the IDT village development scheme and other local level governmental, administrative and judicial powers. In practice however, most village level administrative units throughout Irian Jaya are not able to effectively carry out their responsibilities due to lack of adequately skilled personnel, poor access to resources and information and other constraints. In particular, statistics that should be gathered by the village administrative units are either not collected at all or are of extremely low reliability. The money provided to village level administrative units through the IDT scheme for community development activities have also been almost universally mis-administered throughout Irian Jaya resulting in considerable tension between many Kepala *Desa* and elements of their local communities.

Although the term *Desa* can be translated as village, in Irian Jaya *Desa* rarely corresponds to one village. In fact, WATCH's experience has shown that the *Desa* often incorporate more than one social group and therefore are often not an appropriate structure upon which to base group community development activities.

At the *Desa* level a second governmental structure known as the LKMD or village resilience organization should also assist the village level administration with planning and organizing village level activities. The LKMD should act as an elected village council with advisory powers to the village administration. The chairperson of the LKMD is usually the *Kepala Desa* and the secretary of the LKMD is also usually the secretary of the village administration. The other members of the LKMD are elected by the local community to represent them in the various main sectoral activities in which the village is involved such as religion; security; education and information, environment, community development, health and family planning, youth, sports and the arts; social welfare; etc. The actual size of the LKMD can vary considerably between 12 members covering ten main sectoral units through to several dozen members. The LKMD can also establish smaller working groups to help plan specific activities. In Kanggime and Kembu / Mamit Sub-districts as well as throughout most other parts of Irian Jaya the LKMD system does not function effectively.

6 INFRASTRUCTURE

6.1 TRANSPORTATION INFRASTRUCTURE

There is only one road in Kanggime Sub-district connecting the village of Kutttime in the eastern part of Kanggime Sub-district to Karubaga, Kelila, Bokondini and ultimately the district capital Wamena. This connection has only been completed in the last few months and is only navigable by four-wheel drive vehicles. It takes around 10 - 12 hours to travel one way between Kutttime and Wamena. Furthermore, this road link remains tenuous as the wet climate and rugged terrain cause regular landslides and almost constant maintenance is required to keep the road open. In terms of population flow between the Toli Valley communities and Wamena, the impact of this new road link are not yet evident but it seems likely that the existence of the road will increase travel to Wamena as more Toli Valley Lani people settle more or less permanently around Wamena. There are no roads at all within the sub-district of Kembu / Mamit although the road head at Kutttime lies quite close to the major population centres of Kembu-Mamit.

Wamena remains one of the largest urban centers cut off from vehicular access with other major centers or ports in the world. The district capital is connected to several sub-district capitals by a limited network of roads but despite about 10 years of labour, the road link between Wamena and the provincial capital continues to be dogged by unforeseen setbacks.

There are three functioning airstrips, in Kanggime, Kembu and Mamit. All of these are short grass strips and are located in confined mountain valleys entailing that they are only suitable for light aircraft such as Cessnas. The airstrip at Karubaga is slightly longer and can be used by the larger Caravan aircraft, which MAF also operate. The Mission Aviation Fellowship (MAF) runs fairly regular flights between Wamena and these two airstrips. These flights take approximately 20 to 25 minutes unless the plane is stopping at other destinations along the way.

All other transport within the sub-districts is by foot except in the Mamberamo Ecological Zone where canoes and small boats are more widely used for transportation, as traveling by foot is extremely difficult. Traveling by foot around the target areas is not only arduous but also quite dangerous as it often involves crossing fast flowing rivers on bridges made of bush materials. In this regard WATCH has been attempting to assist the communities to reduce excessive amount of time and risk when traveling to the centralised health facilities by assisting communities with the construction of several more permanent suspension bridges at strategic locations.

From the data in the following tables we can get some idea of the distances between the airstrips at Kanggime and Mamit and the administrative centers of each *Desa* that health workers travel. It should be noted that these travel times are based on the estimates of local people. For most non-highlanders, including the staff of WATCH, these times should be at least doubled.

TABLE 5.
APPROXIMATE WALKING DISTANCES FROM KANGGIME & MAMIT TO OTHER LOCAL POPULATION CENTERS

KANGGIME SUB-DISTRICT		KEMBU / MAMIT SUB-DISTRICT	
<i>DESA</i>	DISTANCE	<i>DESA</i>	DISTANCE
Kanggime	15 minutes	Mamit	-
Nabunage	7 hours	Kembu / Ndundu	7 hours
Kupara / Parari	7 hours	Wamui	10 hours
Kumbur	4 hours	Kage	2 hours
Wuluk	1 hour 30 minutes	Umage / Gatini	3 hours
Nunggawi	2 hours 10 minutes	Yali	7 hours
Yaliwak	4 hours	Woraga	1 hour
Paba / Pabando	5 hours	Yogweme	1 day

Martelo / Yitelo	5 hours
Luguwi / Abera	6 hours
Bogonuk	4 hours
Kokondao / Yingguga	5 hours
Egoni	4 hours

Telenggeme	3 hours
Tirib	3 hours
Panaga	3 hours
Kalarin	
Nologpur	5 hours
Nambu	5 hours
Gelok	3 hours

Data Source: Estimates made by local health workers at Kanggime and Mamit community health centres.

6.2 COMMUNICATIONS INFRASTRUCTURE

There are no telephone communications or mail services connecting Kanggime and Kembu / Mamit Sub-districts with other parts of Irian Jaya. The only means of communication between these sub-districts and other centers is by UHF radio (in Kanggime, Kembu and Mamit) or by couriers traveling by foot or light aircraft. The community health centres in Kanggime and Kembu-Mamit have both been issued with their own UHF radios to free up other radios for regular communications including information regarding church, government and NGO activities, news, flight schedules, etc. It is intended that the radios in the health centers are to be used for communications relating to health issues, medical emergencies and the reporting of health statistics. However, due to limited training and poor scheduling of communications with the District Health Service (DHS) in Wamena the use of the radios is not yet optimal.

As can be seen from the above discussion, the use of couriers is likely to be quite time consuming. However, for many of the more remote villages there is no alternative other than to send couriers on foot for several hours just to reach the nearest radio.

6.3 POWER, WATER AND SANITATION INFRASTRUCTURE

The infrastructure for power generation, clean water supply and sanitation in Kanggime and Kembu-Mamit Sub-districts is basically non-existent. There are solar panels and backup generators located in the major centers of Kanggime, Mamit and Kembu but these are used sparingly, mostly to charge the batteries for the UHF radio sets and run the vaccine fridges. Latrines have been introduced in most areas but it is believed that access to latrines remains limited and the majority of human excrement is not being disposed of in the latrines. WATCH worked with community development groups in both sub-districts to establish better water supply and sanitation infrastructure and encourage its ongoing use and maintenance.

6.4 ARCHITECTURAL INFRASTRUCTURE

Aside from the local *silimos* (described in Section II / 4.1.2), architectural infrastructure in the target areas is extremely limited. There are several small government office building located near the airstrips in Kanggime,

Mamit and Kembu. At these three locations there are also the houses and offices of the missionaries which are now owned by the local church. Of these, some are used as housing and office space for church workers but the most luxurious buildings, the homes of the missionaries themselves, are reserved for use as guesthouses for tourists and other visitors. Other buildings with four walls and tin roofs include the parish churches, many of which have been paid for and constructed by the local communities and serve as an important indicator of civic wealth and pride, the classrooms and teachers houses for a total of 16 primary schools and two junior secondary level schools (see Section II / 6 below), and a scattering of health posts, many of which were established during the period that the mission were responsible for health services. The shortage of suitable buildings has in fact proven to be a considerable constraint on the expansion of health services and consequently the District Health Office (DHO) with some assistance from WATCH has been forced to commit considerable resources to the upgrading or construction of new buildings to house the various health clinics (see Section III / 1.1). Despite these efforts, many health facilities in the target areas continue to operate out of quite sub-standard buildings.

7. EDUCATION FACILITIES AND SERVICES

After the mass fetish burnings of March 1960 RBMU missionaries instituted the first formal education program in the Toli Valley in the form of a bible school at Karubaga. To draw students from across the entire area missionaries requested that each "tribe" or sub-confederacy to have had taken part in the fetish burnings should select one monogamous couple to receive instruction. Ultimately 39 couples were enrolled and resettled in a specially built village near the mission station. Instruction at the new school was limited to religious instruction though some attempts were made to teach pupils to read and write in Lani. Despite initial enthusiasm, student numbers lapsed and after about 18 months the school was ultimately disbanded.

In September 1961 the mission established the first village school and it was taught by a young man from the north coast. By 1963 there were 170 pupils enrolled at the village school, most of them between the ages of 8 and 14. During 1961-1963 the mission trialed a variety of literacy programs including instruction in Dutch, Dani and Indonesian but by the end of 1963 no Lani could speak more than a few words of either.

Since these humble beginnings, the government and mission have more recently worked together to establish a limited network of education facilities throughout the area. Today, the government of Jayawijaya is obliged to provide Kanggime and Kembu / Mamit Sub-districts with education services in accordance with the national standards for education services. These standards require that every *Desa* throughout Indonesia be equipped with a primary school (Sekolah Dasar - SD) and every sub-district should have at least one government run junior high school (Sekolah Menengah Pertama - SMP).

7.1 PRIMARY EDUCATION

There are eight primary schools located in Kanggime Sub-District and eight in Kembu / Mamit. These schools teach students from grades one through to grade six catering for children roughly between the ages of 7 and 12 years old.

TABLE 6. DATA ON PRIMARY SCHOOLS AND STUDENTS IN KANGGIME SUB-DISTRICT

LOCATION / DESA	NAME OF PRIMARY SCHOOL	NUMBER OF STUDENTS						TOTAL
		I	II	III	IV	V	VI	
Kanggime	SD YPPGI Kanggime	50	46	46	26	26	20	214
Nabunage	SD Inpres NABUNAGE	31	55	53	39	13	17	208
Kupara / Parari	SD Inpres PARARI	30	26	25	21	19	15	136
Kumbur	-	-	-	-	-	-	-	0
Wuluk	SD Inpres WULUK	65	30	30	24	6	5	160
Nunggawi	SD Inpres NUNGGAWI	99	37	41	38	14	20	249
Yaliwak	-	-	-	-	-	-	-	0
Paba / Pabando	-	-	-	-	-	-	-	0
Martelo / Yitelo	-	-	-	-	-	-	-	0
Luguwi / Abera	-	-	-	-	-	-	-	0
Bogonuk	SD Inpres BOGONUK	43	45	55	31	15	14	203
Kokondao / Yingguga	-	-	-	-	-	-	-	0
Egoni	SD Inpres EGONI	66	64	45	24	32	17	248
Egoni	SD Inpres DULUNGGUN	35	40	30	25	20	17	167
Total		419	343	325	228	145	125	1585

Data Source : Jayawijaya District Education Service

The number of students in Kanggime is 1,585. There is no data about the number of students in Kembu, but it is approximated that number of students in Kembu is less than 1,500. Thus, the total number of primary school students in both sub-districts is estimated to be just under 3,000.

TABLE 7. DATA ON PRIMARY SCHOOLS AND STUDENTS IN KEMBU-MAMIT SUB-DISTRICT

LOCATION / DESA	NAME OF PRIMARY SCHOOL	NUMBER OF STUDENTS						TOTAL
		I	II	III	IV	V	VI	
Mamit	SD Negeri Mamit	?	?	?	?	?	?	?
Kembu / Ndundu	SD Inpres Kembu / Ndundu	?	?	?	?	?	?	?
Kage	SD Inpres Kage	?	?	?	?	?	?	?
Umage / Gatini	SD Inpres Umagi	?	?	?	?	?	?	?
Yali	-	-	-	-	-	-	-	-
Woraga	-	-	-	-	-	-	-	-
Yogweme	SD Inpres Yogweme	?	?	?	?	?	?	?

Telengeme	-	-	-	-	-	-	-	-
Tirib	SD Inpres Bolobur	?	?	?	?	?	?	?
Panaga	SD Inpres Panaga	?	?	?	?	?	?	?
Kalarin	-	-	-	-	-	-	-	-
Nologpur	-	-	-	-	-	-	-	-
Nambu	-	-	-	-	-	-	-	-
Gelok	SD Inpres Gelok	?	?	?	?	?	?	?
Total		?	?	?	?	?	?	?

Data Source : Jayawijaya District Education Service

7.2 SECONDARY EDUCATION & TERTIARY EDUCATION

In Kanggime Sub-district there is a government run Junior High School located at Kanggime. In Kembu-Mamit there are no government run secondary education facilities and a mission run bible school at Mamit provides the only secondary education available with the sub-district.

Those wishing to undertake senior high school must relocate to either Tiom, where there is one senior high school, or Wamena where there are several. Those wishing to undertake tertiary studies can do so at several occupational training centres in Wamena, including a nurse training college, or through the Cenderawasih University (UNCEN) which has a social studies and sciences campus in Jayapura and an agriculture and forestry campus in Manokwari. Despite the obvious difficulties and considerable expense involved, a number of Toli Valley Lani, including several women, have graduated from tertiary education institutions.

8. THE LOCAL ECONOMY

8.1 GARDENING

The Lani are first and foremost horticulturists with hunting and gathering playing only a minor role in supplying sustenance. Their horticultural systems have been developed primarily for the production of root crops, most importantly the sweet potato, but also to a lesser extent taro and yams.

The agricultural systems applied by the Lani can be described as forms of swidden agriculture with gardens being made on land which has been cleared by cutting and burning its forest cover. Whilst new gardens are sometimes opened in areas covered by primary rainforest, if possible people prefer to use sites which were previously used as gardens and then allowed to pass through a period of around five to tens years of fallow. This preference is due to the fact that the work of clearing the secondary growth and reforming old earthworks on disused gardens is much easier than the task of opening totally new sites in the primary forest.

Lani gardens can take a wide variety of forms depending on a variety of factors including the terrain on which they are located, the types of crops grown and their distance from the owners' *silimo*. Lani horticultural systems have been widely categorised into three types according to form and function and three types according to size and location (see Scovill, 1975b and Tucker, 1987).

8.1.1 TYPES OF GARDENS ACCORDING TO FORM & FUNCTION

A. Ditch and Mound Gardens

The ditch and mound system of gardening is only practiced on the flat or gently sloping land. This system predominates in the North Baliem (Tiom) area where Tucker estimates that 90% of gardens are of this type (Tucker, 1980:10) and in the Ilaga Valley where Larson estimates that around 80% - 85% of gardens are of this type (Larson, 1987:96). In the steep sided valleys of the Upper Toli Watershed as well as in the Upper Hablerifori, Yamo and Sinak Valleys there is a limited area where this gardening system is practical. Consequently it is estimated that, at least in the Upper Toli Valley, this system is applied in less than 20% of gardens. In the northern parts of Kambu-Mamit Sub-district, where the relief is less extreme, this type of gardening is presumably more widely applied but limited knowledge of local conditions makes it hard to place an exact estimate on the systems prevalence in these areas.

These types of gardens are generally constructed as elongated raised beds with shallow drainage ditches running down the slope. The height of the mounds and the depth of the drainage ditched depends largely on the slope of the land and local rainfall conditions, but they normally measure between 50 and 150 cms from the bottom of the ditches to the top of the mounds.

B. Sloping Gardens

The majority of gardens in the Upper Toli Valley, estimated at around 70-75% of all gardens, are built on steep sloping land.

Whilst some sloping gardens are simply cleared, lightly tilled and cultivated, in other cases Lani men will construct a limited system of terracing using poles, rocks, and earth barriers to reduce the rate of surface run-off and soil erosion. However, these terraces are relatively shallow and rudimentary, especially when compared to the extremely sophisticated terracing systems applied in many parts of Western Indonesia and even compared to certain other Highland Papuan terracing systems such as those practiced in parts of the Lower Grand Valley. Whilst these terraces are relatively effective in maintaining soil fertility over a period of several growing cycles, soil erosion and land slippages are a constant problem, especially when the area has become subject to seismic disturbance.

In the Upper Toli Watershed the two main factors which appear to discourage the adoption of more sophisticated, effective and permanent terracing systems (such as those being promoted by WATCH) are low soil fertility and low population pressures, at least when compared to other areas in the Papuan Highlands. These factors ensure that there is a relatively short cycle of garden use and a long cycle of fallow. As the site will be abandoned after only a short period of cultivation, and as when people do return their work will have been undone by nature, there is little incentive to establish more extensive and permanent soil erosion controls. Presuming that low soil fertility and population pressure combined with relatively gentle local terrain are the main factors likely to limit the amount of effort that communities are willing to apply to erosion control, then we should expect that it will be much harder for WATCH to promote new terracing systems in the northern two thirds of Kembu-Mamit Sub-district, where the population is very sparse, soils are very poor and the terrain is much less rugged.

C. Taro Gardens

In some regions the main form of agriculture is the preparation of large taro gardens. This method of cultivation, which is dominated by men, relies on flat or moderately sloping land. The gardens are prepared mostly by slashing and burning and there is very little tilling or mounding of the earth. Flat land without mounds or ditches is used because taro requires rich, humus soils with a higher moisture content than sweet potato. Whilst these gardens are the main sources of taro crops, smaller plantings of taro can also be found in parts of the two other garden types described above, planted in positions where soil water content is higher, i.e. around the bases of mounds and alongside drainage works.

In some other parts of the Irian Jaya Highlands, such as the Grand Valley and the Tsinga Valley in Mimika District¹⁷ taro cultivation often involves limited irrigation systems using either deep ditches or bark troughs to channel water from nearby rivers or pools to the garden site. The practice of irrigation is considered quite rare in

¹⁷ For a description of irrigated taro gardens amongst the Amungme of the Tsinga Valley refer to Cook (1995: 255).

Highland Papuan horticulture, where the main concern is to ensure that the soil is adequately drained to prevent sweet potatoes from rotting. Whilst such irrigation systems have not been recorded amongst the Toli Lani, it is quite possible that some forms of irrigation do occur, especially in the northern parts of Kembu-Mamit Sub-district where taro cultivation is likely to be more prevalent.

8.1.2 Garden Types According to Size and Location

A. *Silimo* or Hamlet Gardens

These gardens are located either within the *silimo* compound (see Figure 2) or occasionally in locations adjacent to or between a cluster of *silimos*. These are principally used for the production of a range of specialized crops including tobacco, bananas, ginger, taro, sugar cane and gourds. However, women will often plant small plots of sweet potatoes in some plots as a source of food at times when the woman cannot travel to the main gardens. The planting of green vegetables and pulses in these gardens also appears to have been becoming increasingly popular since at least the late 1980s (Tucker, 1987).

WATCH attempted to promote better nutrition by encouraging the development of *silimo* gardens as an important source for dietary diversity and nutrition. The project distributed nutrition starter packs containing a range of pulse and vegetable seeds that the CD groups were to use to establish a group demonstration plot nutrition garden (*demplot gizi*). When the seeds grew and multiplied they were to be distributed to other group members for planting in their own home nutrition gardens.

B. Family Gardens

What is described as a family garden is a much larger garden normally maintained by an extended family group living within one *silimo* or occasionally an entire *silimo* community, and is normally located within half an hours walk from the *silimo*. Plots within these gardens will be allocated to the different adult female members of the group. These gardens are an important source of food staples, either sweet potatoes or taro depending upon the functional type of the garden, as well as fruits, vegetables and a range of cash crops. As rights to use land for *silimos* or gardens are held corporately by patrilineages, each of which is associated with one or two hamlets, the siting of family gardens requires agreement from the senior or leading man or men of the patrilineage. However, the power of “big men” is quite limited and no members of the lineage could be actively discriminated against in terms of access to agricultural land without the risk of internal conflict.

C. Communal Gardens

The communal gardens are similar to family gardens except that these gardens are much larger and are the result of a large collective effort. These gardens are usually organized at the sub-confederacy level but they can also occur at the confederacy level if the confederacy leader wields sufficient influence across both sub-confederacies. Once again the individual plots and beds within these gardens are allocated to the different adult

females of the sub-confederacy or confederacy group. Despite the ongoing practice of this form of agriculture, many individual Lani people seem to be less than happy with these type of garden arrangements as the gardens must necessarily be located further from the homes of at least some of the joint owners and because the remoteness from the home and the communal nature of the gardens makes it much easier for others to enter the garden and steal produce. In such a communal situation it is also more likely that the crops of one woman who diligently tends her gardens, will be adversely affected by the poor horticultural practices of the owners of nearby beds. As a consequence, many women seem reluctant to plant their most valued plant resources in such a situation and the communal gardens tend to display less overall diversity of crop varieties. In fact, it seems that the practice of communal gardening serve principally as a means of reasserting social relations rather than for the maximization of production. Not only do such communal gardening efforts create a rare opportunity for the gathering of large numbers of men to assist with opening the new site, and for big men to show their prowess by the number of people they can draw together, but it also provides a public arena for the display of gardening prowess on the part of individual women. Whilst some observers have commented that the practice of communal gardening has declined somewhat since the introduction of the cash economy¹⁸ it also seems quite likely that communal gardening efforts are just as common today as they were in the past, but nowadays leaders are more likely to frame the community effort within the context of, or under the patronage of, government or NGO development projects, such as the communal activities undertaken by many WATCH CD groups, rather than for the construction of large, non-aligned, sweet potato or taro gardens.

8.1.3 THE HORTICULTURAL CYCLE

Whilst the lack of clear seasonality in the Irian Jaya Highlands means that gardens can be planted and harvested at any time throughout the year, many Lani communities establish their gardens, and most importantly the larger communal gardens, so as to coincide with dry conditions. Dry conditions facilitate the slash and burn process.

Whilst there are no accounts available of such practices amongst the Toli Valley Lani, Gordon Larson provides a description of what he refers to as a bi-seasonal cultivation system practiced by the Ilaga Valley Lani. Given the similarities in regards to the north and south facing aspects in the Upper Ilaga and Upper Toli Valleys, this system seems quite likely to have some relevance, at least in Kanggime Sub-district. According to Larson, the Ilaga Lani plant small gardens throughout the year but maintain a seasonal pattern of large scale cultivation with the major communal gardens on opposite sides of the valley being prepared a different times of the year:

“Communities on the south side of the river generally prepare their large communal gardens during the drier weather in May and June and plant during wetter weather in July and August. On the other hand, those on the north side of the river dig their larger gardens during the drier months of January and February. Those on the south side plant in July and August, right after the June solstice, in order to capitalize on the morning sun when it rises in the northern extremity of the eastern horizon, shedding most of its warmth on the south side of the valley. Conversely, communities on the north side of the valley plant in January and February, right after the December solstice, in order to take advantage of the morning sun when it rises in the southern extremity of the eastern

18 See Scovill (1974) and Tucker (1987).

horizon, shining brightest on the north side of the valley. Complementary seasonal cultivation of this kind has a twofold function, in addition to increasing growth rate through maximizing morning sunlight. First, it permits garden work crews to assist each other from opposite sides of the valley when they need help most. More importantly, it provides for a more steady staple food supply because the larger gardens mature at different times during the year.” (Larson, 1987)

The stages involved in the preparation of a new garden vary somewhat depending on what type of garden is being constructed. Yet based on the results of group discussions, field observations and other literature, we can summarise that Lani gardening practices run according to the following nine phases:

A. Slashing

Slashing vegetation growing on the site is the first stage of garden preparation. This work is usually done by groups of men and adolescent boys and depending upon the size of the garden in question, quite large work teams may be formed for this purpose. Not all of the men or boys involved in such work teams will necessarily directly benefit from the produce ultimately derived from the garden but they assist relatives or other members of their sub-confederacies or confederacies in this work on a reciprocal basis. Prior to the widespread dissemination of steel tools in the Toli Valley during the early to mid-1960s, this work was conducted using only stone adzes and fire sharpened digging poles. Today this work has been made much easier through the availability of bush knives (machetes) and steel axes. Despite such quantum technological advances, the work of slashing garden sites remains very arduous. This task is usually completed over the course of a few days but may take up to several weeks depending upon the size of the garden site and the number of men who are working on it.

B. Fencing

Once the garden has been slashed, vegetative materials are left for several weeks to dry out. During this time men undertake the second task in the gardening cycle, the construction of fences around the garden site in order to keep pigs out of the gardens. The fences are usually constructed from split wooden boards that are driven into the ground and lashed together at the top and the base using sapling trunks and locally available vines. The fences are also protected from the rain by a capping of grasses or other materials but these are added later, after the garden site has been burnt.

C. Burning

When the vegetation slashed is judged to be sufficiently dry, men will burn the dried vegetation to fully clear the site. The burning of the vegetation is also important in creating an ash layer across the garden site, which raises the concentrations of potassium, an element important in the growth of tuber crops, in the soil. In burning this vegetation Lani men carefully protect fruit trees, coffee bushes and other valuable plant resources already growing on the site. A number of established trees will normally be left growing on the site to provide some shade, fuel wood, soil fertilisation and conservation.

D. Tilling and Earthworks

Shortly after the garden has been burned, the initial tillage of the soil and construction of the earth works will be undertaken by the men and boys. The nature and extent of these tasks is largely determined by the terrain on which the garden is located and its distance from the hamlet. On flatter locations this phase is likely to involve the initial formation of raised garden beds and the excavation of drainage ditches. In steeper areas, the construction of wood or stone earth retaining structures is more likely to be the focus. As a rule of thumb, the further a garden is from the *silimo* or hamlet of its owners, the less intensively it will be worked. Therefore, as distance increases from the hamlet the more limited the extent of tillage and earthworks. This work is also quite strenuous and will occur over a period of a few days or weeks depending upon the size of the garden, the extent of tillage and earth working and the available labour force. During this phase the garden will also be divided into a series of separate allotments each of which will be given to the different women of the *silimo*, hamlet or confederacy to plant, maintain and harvest.

E. Hoeing and Planting

As the men complete the tilling and earth-working phase of the horticultural cycle, the women begin preparations for the planting of their garden allotments. Sweet potato cuttings from their home gardens or from old garden sites are collected and placed in a shaded location around the *silimo* or garden site for several days to allow them to sweat and thus promote the formation of new roots. Around this time women begin the task of finely hoeing the soil, which has already been broken up by the men, using a light digging stick or a spade, which has been ground down to a fraction of its original size to make it more useful for this task. The earth is usually formed into small raised mounds each of which is planted with two or three sweet potato cuttings or other crops such as taro, corn and peanuts. Around the edges of the gardens, along fencelines and around the bases of trees they will also vine crops such as pumpkins, choko gourds and different varieties of climbing beans. The work of hoeing and planting the garden will normally occur over a number of weeks so that the harvest can be staged over a longer period of time.

F. Weeding and Pruning

During the following months, the women and their female children will visit the gardens several times, usually about 3 times, in order to weed the gardens and thus reduce competition for light and nutrients. Weeding is done using the light digging sticks or ground down spades and involves lightly hoeing the soil and pulling out the undesired plants. The vegetative materials thus removed are placed upon the sides of the garden beds, around the bases of the remnant trees or along the tops of the garden fences. During these visits the sweet potato vines will also be pruned to stop them spreading to far and encourage the production of large tubers rather than a large mass of leaves and vines supporting many small tubers. The trimmings taken from the sweet potatoes at this time will also be used as greens for the evening meal. As the sweet potatoes approach maturation pruning will cease so as to allow the tubers to mature without further disturbance. In order to ensure a stable supply of food, during any given period, a woman will attempt to be involved in working several garden locations and many

garden beds all at different stages of maturity.

G. Harvesting

Depending upon the altitude and microclimate of the garden site, the sweet potatoes will be ready for harvest after an interval of around six to nine months from the time of planting¹⁹. Once women have determined that the sweet potatoes are approaching maturity, through observing changes in the leaves and by noting when the lower branches of the vines begin to lignify, she will carefully dig around the plants with her digging stick or ground down spade to determine the size of the tubers and their readiness for harvest. If she judges that the tubers are still not quite ready to be harvested she will cover it over again with soil and return to check it again after several more days or weeks. Once the garden begins to produce, the women will visit almost every day for a number of weeks and on each visit she will harvest only enough potatoes for her families needs over the next day or two. After harvesting from their gardens, women will always stop to wash their produce in a river or stream before returning to the *silimo*.

H. Pig Tilling

Once the garden is considered to be fully harvested, pigs belonging to the group will be let loose in the gardens to root for remaining tubers as well as worms and grubs. This not only provides the community with a cheap means of feeding their pigs, but it also serves to revitalize the soil through the addition of pig manure and the tilling action of the pigs whilst helping to reverse the process of sweet potato pest build up which occurs during each cropping period.

I. Fallow

Once the pigs have foraged on the garden site it will normally be allowed to go through a short fallow period of several months duration before being re-cleared and replanted. In the Upper Toli Watershed gardens are normally used for around two years and sometimes for up to three years. After a number of crops have been produced from the garden and the soil fertility begins to be noticeably diminishing, the site will be abandoned for a much longer fallow period, normally around five to ten years but sometimes longer, especially in the less fertile northern part of Kambu-Mamit.

8.1.4 Agroforestry

The Toli Valley Lani also engage in several types of agroforestry including the cultivation of two types of pandanus or screw pines and the planting of casuarinas and other trees for firewood, timber, soil conservation and fertilization.

19 Periods of up to or over 12 months have been reported for the maturation of sweet potato crops at altitudes of around 2,400-3,000 metres (see Larson (1987:100)).

The Highland Nut Pandanus - *Woromo*

The most important of the tree crops traditionally grown by the Lani is the nut pandanus trees (also known as *Karuka* in the PNG Highlands), which are known locally by as many as 28 different varietal names and a number of different and seemingly quite important group names. However, the entire complex of varieties is sometimes referred to by the name *woromo*. The nuts can be eaten raw but are more often roasted or smoked over a fire.

The trees themselves look something like a palm, to which they are not closely related, with long stilt roots growing from the lower few feet of the branching trunk and the fruits large knobby drupes about the size of a bowling ball, which are comprised of hundreds of separate nuts.

Whilst most pandanus species are normally associated with tropical coastal areas, the *woromo* trees grow at quite high altitudes, with the altitudinal range of the lowest growing varieties extending down to about 1,800 metres above sea level and the upper range for the highest varieties ending at about 2,700 - 3,000 metres. 2000 to 5000 mm. They grow well on poorly drained sites but can also be grown on better-drained sites.

Whilst many earlier observers considered the pandanus trees to be a wild species which the locals simply availed themselves of, recent research suggests that the *woromo* trees are actually a botanical complex of at least two, and probably three or more species, some of which are actively cultivated and bred by highland many different Highland Papuan groups. Both Dr. Benjamin Stone (1976, 1982, 1984) and Dr. Carolyn Cook (1995: 181 – 185), suggest that the *woromo* trees which grow at lower altitudes and are often planted in small groves near settlements or as large dense stands that grow along the lower edge of most of the upper montane rainforests are mostly varieties of *Pandanus julianettii*.

Therefore far from being simply there for the locals, this species is widely cultivated by Highland Papuans using both seeds and cuttings and applying principles of plant selection to improve the overall gene pool of varieties. Higher up the mountains the *P. julianettii* varieties are gradually replaced by varieties of *P. brosimos*. This species does not seem to be planted by Highland Papuans, the Lani claim that these varieties are planted by cuscus, but many of the apparently wild groves occurring throughout the upper-montane rainforest are actively maintained through the removal of competing vegetation, the cleaning and culling of trees and the wrapping of the developing fruits in order to stop forest mammals from eating them. Both of these species are considered to be extremely important sources of both food and exchange / trade surpluses and Lani men may travel to the mountains in order to tend and harvest their pandanus trees as often as four times a year with the main nut harvests occurring around January – March.

At the highest altitudes a number of less desirable cultivars occur. Some of these may belong to a third major species, identified by Stone (1984: 311) as *P. antarisensis*. These trees do not seem to be cultivated or maintained. However, the Lani and other Highland Papuan groups still appear to consider these trees as being

an extremely important, both as a source of extra food when hunting or traveling in the forests and also as a famine food supply.

Whilst the nutritional aspects of the nut pandanus species and varieties has not been adequately researched, the results of initial chemical analysis of pandanus nuts, as displayed in tables 8 & 9 below, coupled with widespread observation of the importance which Highland Papuans attach to these plants and the large volumes of nuts they have been observed to consume when they are in season, strongly suggests that these nuts are an important source of calories and protein during the nut season and may also be an essential famine food.

TABLE 8.
CHEMICAL ANALYSIS OF SMOKED DRY PANDANUS NUTS (INCLUDING MESOCARP) % DRY MATTER

% DRY MATTER	CRUDE PROTEIN	ETHER EXTRACT	CRUDE FIBRE	ASH	NFE*	CA	P
88.6	13.8	36.5	11.8	5.7	32.2	.24	.31

Notes: NFE = Nitrogen free extract equivalent to soluble sugars and carbohydrates, including starch.

Data Source: Stone, 1982.

TABLE 9.
CHEMICAL COMPOSITION OF PANDANUS JULLIANETTII NUTS EXPRESSED IN G/100G EDIBLE PORTION

	MOISTURE	CALORIES	PROTEIN (G)	FAT (G)	CARBOHYDRATE (G)	FIBRE
Fresh	9.0	683.0	11.9	66.0	22.0	6.1
Dry	6.0	618.0	11.7	43.8	26.5	4.8

Data Source: Hyndman (1984)

On the other hand, it has also been suggested that behaviour often described as pandanus madness, or the habit of many Highland Papuan men to drop all other responsibilities and disappear into the forest for weeks or even months on end in order to harvest the pandanus nuts, may contribute to shortages of food and increases in child malnutrition rates several months later. This is believed to occur because, in particularly good pandanus nut seasons the interruption caused to the construction of new gardens may be too long, which means that around 6 – 12 months after the pandanus season food shortages may occur. However, this theory has not yet been adequately tested and it remains unclear if pandanus nut harvesting activities have any deleterious effect on Toli Valley Lani nutrition.

Cook (1995) has suggested that aside from their nutritional value, the *woromo* groves also play an extremely important ecological role. As she points out, since the 1960s many traditional taboos have been eroded yet taboos associated with pandanus nut groves, including taboos against defecation, spitting or destruction of the groves have continued. Adherence to these taboos serves to protect the immediate catchment areas of many Highland Papuan communities.

Whilst these nuts have considerable potential as a cash commodity, due to their importance in local nutrition, trade and exchange and the fact that most of the existing niches where *woromo* can grow have already

been planted, means that it will be difficult to greatly increase the surplus of nuts available for trade as a cash commodity. On the other hand, prudent storage and trading of woromo nuts, especially to Highland people living in lowland towns such as Jayapura, could prove to be a viable microenterprise option for some Lani women.

Red Pandanus / *Tawi*

The red pandanus plant, known locally as *Tawi* and botanically as *Pandanus conoideus*, looks quite similar to the nut pandanus except that its fruit is shaped like a metre long, blood-red spike. It is normally cultivated at lower altitudes between about 800 and 1,500 metres above sea level and small groves of tawi trees, which are individually owned and maintained by men, can be found scattered throughout the Toli Valley landscape, often on the sites of abandoned gardens or close to *silimos*. The red pandanus is consumed in the form of an oily red sauce, which is prepared by cooking the fruit then kneading it into a pulp and straining of the seeds. It may be eaten alone or with vegetables. The red pandanus fruit is highly valued by the Lani and considering the limited sources of protein and fat available in the Lani diet, they fruit would appear to be a nutritionally important part of the Lani diet.

Casuarina and other trees

The third major type of agroforestry practiced by the Lani involves the planting a of *Casuarina* or *sheoak* trees in or around garden sites, around *silimos* and sometimes also on disturbed or unstable land. These trees are nitrogen fixing and thus the leaves, which they drop over time help to raise nitrogen levels in the soil. This fact is clearly recognized by the Lani as they state that their purpose in planting the trees is to ensure that the sweet potatoes growing nearby will grow large tubers and also to help retain the soil. The lower branches of these trees are also pruned to a height of around five metres, both to limit the amount of shade being cast by the trees on nearby crops and also as a source of firewood. Some trees may also be culled, usually after a long fallow period, in order to maintain a good spacing between trees, and the timber from the culled trees is a source of highly prized construction materials. The trunks of trees are also used as a supporting structure for climbing crops such as beans of choko and provide some degree of protection for both humans and crops from the climatic extremes.

The means by which Lani and other Highland Papuan groups propagate the *Casuarina* trees is worthy of investigation. For many years western plant propagators found it extremely difficult to propagate casuarinas trees from either cuttings or seed until it was discovered that the germination of *Casuarina* seeds is largely dependant upon the presence of a type of fungus, which only grows on and around casuarinas roots. Field observations suggest that the Lani and other Highland Papuan communities in Jayawijaya are reliant upon wild germinated *Casuarina*, which are then transplanted, along with some soil and their root fungus, into the desired growing location. Whilst such wild stocks of *Casuarina* seedlings may be sufficient for normal community needs, agroforestry development programs which seek to rapidly expand existing plantings of *Casuarina* trees, should consider the use of soil inoculation techniques to aid in seed germination and also possibly to reduce

transplanting stress on the trees. It may be possible to establish simple field techniques for field inoculations and it may even prove to be the case that some Jayawijayan communities are already aware of some forms of *Casuarina* inoculation techniques.

8.2 HUNTING AND GATHERING

The hunting and gathering activities of Toli Valley Lani men do not seem to make a significant contribution to nutrition. Most hunting activities are more for sport and to provide the Lani with a range of skins, plumage and other animal or plant products used for various decorative, ceremonial or trade purposes. Game animals hunted by the Toli Valley Lani men include a range of rodents; marsupials such as cuscus, possum and tree kangaroos; birds including mountain cassowaries and several species of Bird-of-Paradise; snakes such as the Bowlen's python; bats; and also wild pigs. Whilst the meat of such game animals is highly relished and any game captured is normally cooked and eaten almost immediately, the acquisition and consumption of meat appears to be a somewhat incidental end to the activity. The Lani use at least one form of trap to catch cuscus and also construct small bird blinds or hides close to known salt licks in order to be able to get close enough to birds to be able to shoot them with their short range bows. Otherwise most hunting is conducted using dogs or by gangs of young boys who will spend much of their time hunting small game with sticks, rocks or small bows. Men also gather a range of forest products, most notably the valuable wood of wild limbun palms (*Carryotta sp.*) which is used to make spears, bows and arrow heads, certain medicinal plants and a range of forest foods and insects, particularly grubs and the larvae of certain moths, for immediate consumption.

Whilst gathering activities by the women make more of a contribution to Lani diets for their 'catch' is shared with all whereas men tend to consume their spoils with the other hunters. The main forest foods gathered by Lani women include ferns and other plants for use as vegetables. Other gathering activities include the collection of various fibre and dye plants, such as the bark used in the manufacture of local string, orchid fibres used to decorate nets and braided belts, and the berries used to make dyes, medicinal plants and some insect species.

8.2.1 FISHING AND AQUACULTURE

Unlike some waterways in the highlands of Jayawijaya, such as the Baliem and rivers and lakes where crayfish are often abundant or the Sibil River in Ok Sibil where fresh water crabs are common, no indigenous fish or shellfish were present in the upper Toli River or any of its tributaries prior to contact. Several species of fish occur in the lower reaches of the Toli and other rivers in Kembu-Mamit Sub-district but the overwhelming majority of Lani people had little or no access to these sources of protein. By the early 1960s the mission had built artificial ponds at Karubaga, Kanggime and Mamit, and stocked them with fish from the coast. The Lani are said to have eagerly accepted this innovation from the outset and quickly began building their own ponds and approaching the missionaries with requests for fish with which to stock them.

For many Toli Valley Lani aquaculture has proved to be a marginally profitable and somewhat precarious form of subsistence or economic activity. Whilst individuals and groups to continue to try their hand at fish farming, the steep terrain, the regular flooding of rivers and streams and the general geological instability of the

area often means that fish stocks may be lost and ponds may be destroyed. Perhaps more importantly, most groups which WATCH have observed practicing aquaculture have failed to establish effective restocking regimes over the longer term and have ultimately eaten or sold their own breeding stock. Whilst WATCH has previously promoted aquaculture amongst Jayawijayan communities, during the Kanggime extension it has not been identified as a priority income generation activity.

8.3 CROP DIVERSIFICATION

Crop diversification was considered an important activity in WATCH's program. It was seen as helping boost community development and raise the nutritional status of women and children. Whilst no accurate or detailed study of ethnobotany of the Toli Valley Lani appears to have been carried out, from the data on Konda Valley cultigens collected by O'Brien in the early 1960s (see table 10 below), we can get some idea regarding the diversity of crops traditionally grown in the Upper Toli Valley.

O'Brien (1969) lists in approximate order of their quantitative importance the main food plants which had, by 1963, been recently introduced to the Toli Valley:

“white potatoes, tomatoes, cabbage, papaya, a species of banana native to coastal New Guinea, onions, carrots, beets, zucchini squash pineapple, passion fruit, lettuce and at least two varieties of melon. Of the introduced cultigens (aside from corn) only white potatoes, tomatoes, cabbage, and papayas are produced in quantities large enough to warrant sale to the mission. These four items have also become a subsidiary part of some Lani diets. Potatoes and cabbage are cooked; tomatoes and papaya are eaten raw. They classify cabbage and lettuce with their indigenous, leafy green vegetables which were always steamed. Carrots were classed with the native root crops which also were always cooked. Tomatoes, however, were seen as analogous to cucumbers, which were invariably eaten raw.” O'Brien (1969: 33 – 34)

O'Brien (1969) further describes how by 1963 peanuts had already been introduced as a supplement to the local diet but that the community had not taken to cultivating and consuming them. She attributes the poor uptake of this crop to the fact that the government representatives who distributed the peanuts had failed adequately explain how to cultivate, cook and consume peanuts and also because the new crop bore little resemblance to any of the crops which they already cultivated. In either case it is clear today that these problems have been overcome, as peanuts are almost as ubiquitous as corn and cucumbers in Lani gardens and out of all agricultural assistance, peanut propagules were most often requested by the CD Groups.

The WATCH baseline CD questionnaire generated the data displayed in Figure 5. Since the humble beginnings recorded by O'Brien, the Toli Valley Lani have considerably increased the varieties of crops with peanuts, soya beans, string beans, potatoes, corn shallots, garlic, spring onions coffee and short term fruit crops all being widely cultivated in the target areas. It is interesting to note from this data that whilst long term fruit crops, including jackfruit, citrus and avocados, appear to be quite popular in Kembu-Mamit Sub-district, they have only been planted by a small percentage of people in Kanggime. The jackfruit tree will grow much better at the lower altitudes found across much of Kembu-Mamit Sub-district, but for citrus and avocado no reason for

this preference is apparent.

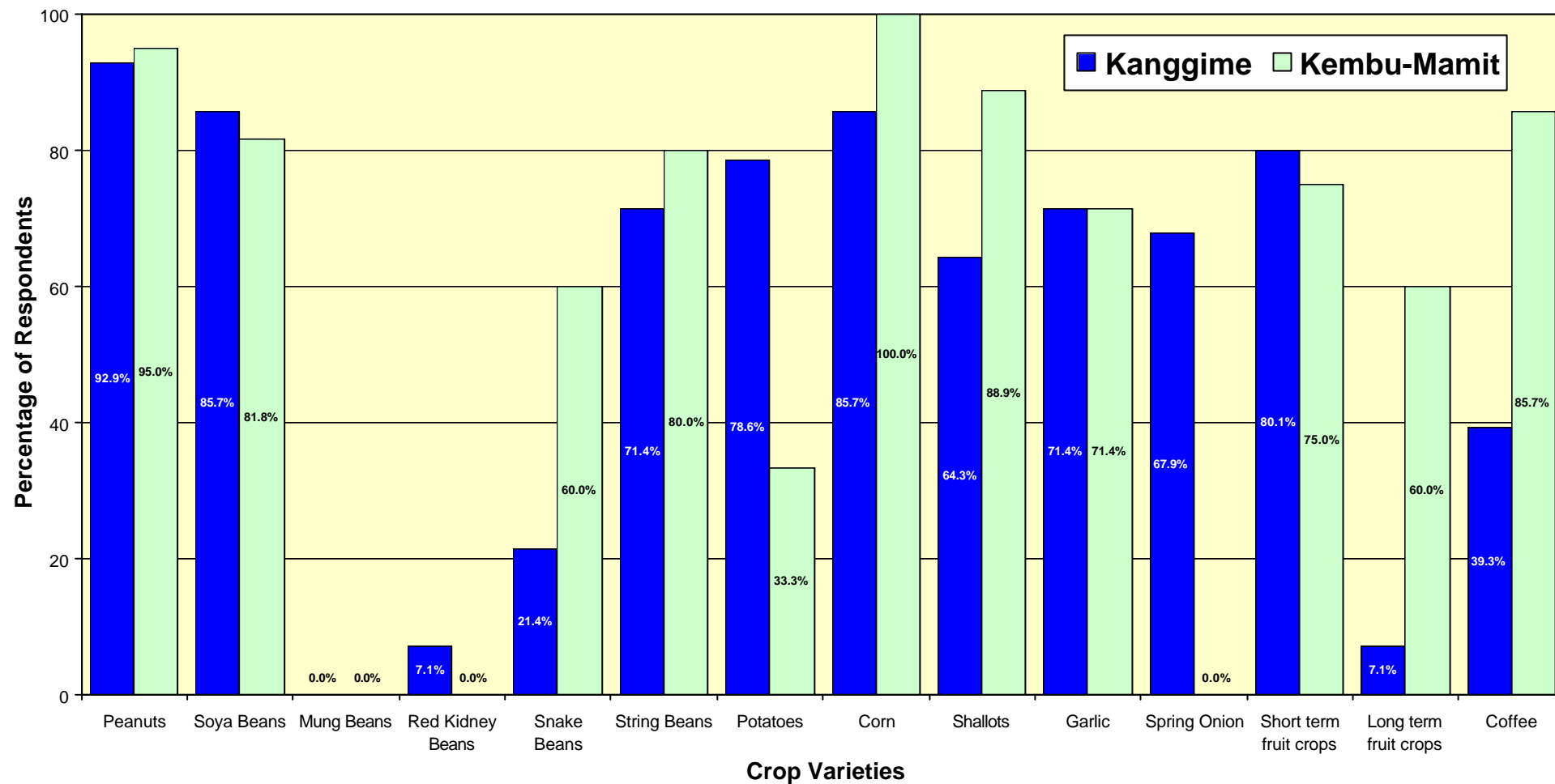
TABLE 10.
TRADITIONAL PLANT VARIETIES CULTIVATED IN THE KONDA VALLEY
AS RECORDED BY O'BRIEN IN 1961-1962

ENGLISH NAME	BOTANICAL NAME & AUTHORITY	LANI NAME	NO. OF VARIETIES
Sweet potato	<i>Ipomea batatas</i> (L.) Lamk.	Mbi	43
Taro	<i>Colocasia esculenta</i> (L.)	Kom	21
Yam	<i>Dioscorea alata</i> (L.) <i>Dioscorea bulbifera</i> (L.) <i>Dioscorea nummularia</i> (Lamk.)	Wani	9
Banana	<i>Musa sapientum</i> (L.) <i>Musa. paradisiaca</i> (L.) <i>Musa cvs.</i>	Lawi	28
Red Fruit Pandanus	<i>Pandanus conoideus</i> (Lamk.)	Tawi	35
Nut Pandanus	<i>Pandanus brosimos</i> (Merr. & Perr.)	Woromo	34
Sugar cane	<i>Saccharum officinarum</i> (L.)	En	15
Winged bean	<i>Phosocarpus tetragonolobus</i> (D.C.)		-
Corn ²⁰	<i>Zea mays</i> (L.)		5
Mountain Pit-Pit	<i>Setaria palmifolia</i>	Towan	?
Pit-Pit	<i>Saccharum edule</i> (Hassk.)		?
Cucumber	<i>Cucumis sativus</i> (L.)		-
Squash	<i>Lagenaria sieraria</i> (Mol.) Standl.		4
Green Vegetables			
Sweet potato leaves	<i>Ipomea batatas</i> (L.) Lamk.	Mbiengga	-
	<i>Solanum sp.</i>	Tidak	-
		Tabengga	-
		Wangit	-
		Nubom	-
Ginger	<i>Zingiber zerumbet</i> (Sm.)	Kende	3
Tobacco	<i>Nicotiana tabacum</i> (L.)	Nik	3

Data Source: O'Brien 1969: 32

20 Corn, although present in the Toli & Konda Valleys when the first missionaries arrived in 1957, is not an indigenous crop. It seems to have been introduced into the region sometime between the 1930s and 1950s through Ekagi and Moni traders who had obtained corn from the government and missionary posts in what is now Paniai District. By the time the missionaries arrived corn had already become an integral part of the Lani diet with O'Brien describing it as being more important than either taro or yams. Corn is eaten on the cob after being roasted, steamed or boiled.

FIGURE 5.
EXTENT OF CROP DIVERSIFICATION IN KANGGIME AND KEMBU-MAMIT SUB-DISTRICTS



8.4 COFFEE & OTHER PLANTATION CROPS

Coffee was first trialed in the Toli Valley in 1961 when the Dutch government established an experimental plot near the Karubaga station (O'Brien, 1969). This planting was part of a larger program that was trialing new plant species in the Baliem Valley and at Bokondini. The government hoped that coffee was be viable in this environment so that it could become a cash crop for native production as had been done in the Highlands of what is now Papua New Guinea.

Despite its early beginnings in Jayawijaya it was not until the early 1990s that coffee production began to approach high enough levels to allow for an inter-district and inter-provincial coffee trade. By the mid-1990s a number of private entrepreneurs had begun to realize the potential of the coffee trade out of the highlands and began to encourage Highlanders to rapidly expand their coffee holdings by offering relatively high prices and in some cases, limited assistance for the development of plantations.

Around this time the Provincial and District Governments also increased their support for the establishment of a coffee export industry through its "Sustainable Agriculture and Development Program (SADP) which provides assistance to groups willing to establish coffee plantations. To be eligible for this program you needed a land mass of 25 hectares or larger in the Tiom, Pirime, Makki, Kelila and Grand Valley areas. Despite the ideal conditions for coffee production, Kanggime and Kembu-Mamit were not included in the SADP because they were considered too remote from the market center in Wamena. However, given that the road link between Wamena and the Toli Valley has recently been completed, and assuming that the expansion of the local coffee industry will continue (this seems highly likely given current exchange rates that favour exporters) it seems that within the next five to ten years coffee production in the Toli Valley will increase considerably and the area may even become the focus of further government or NGO coffee development programs.

Whilst economic opportunities for people in Jayawijaya is important, from both a social and an environmental point of view, broad acre plantations of coffee continue to be problematic in the New Guinea Highlands. One of the main concerns for WATCH is that they may take up land normally used for subsistence agriculture and leave people dependent on a single commodity with fluctuating prices. Small holder coffee plantations on the other hand are judged to be socially, economically and environmentally appropriate and WATCH has encouraged the integration of coffee bushes into the mixed farming / LEISA agriculture systems which they have been promoting both to aid in erosion control and as a source of cash income.

From the data in Figure 5 we can see that just over 85% of respondents from Kembu-Mamit are currently involved in coffee production whereas just under 40% of respondents from Kanggime said that they were growing coffee.

Besides coffee, a number of other plantation crops including cacao, cardamom, upland vanilla and cinnamon which are well suited to cultivation in the lower altitude areas of Kembu-Mamit Sub-district. Vanilla, cinnamon and cardamom also have a high enough weight to value ratio to make their production in a remote area viable. However, given the current absence of buyers for these products within Irian Jaya, short term prospects for the development of alternative plantation crops seem limited.

8.5 ANIMAL HUSBANDRY

8.5.1 PIGS

Pigs are held in the highest esteem and are an important part of social life in all Highland Papuan societies. Indeed Enga men are reported as saying that "Pigs are our hearts" (Meggitt 1974). The Lani are equally vocal about their attachment to and dependence on pigs and almost all Lani rituals centre around the slaughter and consumption of pigs. Pigs are an inalienable part of any Lani marriage payment or exchanges and a prominent feature of the feasts and exchanges accompanying life events such as birth, marriage, initiation and death. Many ceremonies, especially divination and curing ceremonies require the killing of one or more pigs. Previously pigs were also killed before some tribal battles in a ritual designed to ensure the warriors' success and survival. They were always killed at the end of a war, both in the peace-making ceremonies between enemy groups and in the feasts accompanying indemnity payments made to allies.

Pig ownership confers prestige on a man and enables him to enhance his prestige by being a generous donor in various exchanges, such as marriage payments or funerals. A man possessed of a large herd may also further his reputation by lending pigs to others who have a more immediate need for them. The number of pigs actually held by a man at any given moment is not really as important in determining his net worth and status as is the total calculation of how many pigs he owes other people, either as repayment of loans or as obligations, in forthcoming exchanges-balanced against how many pigs are owed to him. Repayment of some pig debts may stretch over a number of years and at death a man's 'pig rights' and obligations are inherited by his sons. Women and children may also own pigs and often do, though their holdings and obligations never equal those of adult men and the ultimate disposal of the animal is heavily often influenced, if not actually determined, by the needs and wishes of a husband or father.

Pigs have also been vital part of inter-valley trade with pigs having traditionally been one of the Toli Valleys primary exports. When traded out of the valley or donated at inter-group exchanges, pigs are nearly always alive. Piglets, of up to about 25 kgs, are carried in a man's or woman's arms or in a woman's net bag. A larger pig that must be transported any distance over several kilometres is trussed up and bound to a pole with the pig then being carried upside down by two men who rest the pole on their shoulders.

Besides their ongoing value within the traditional exchange economy, the value of pigs in the cash economy in Jayawijaya is also very high. In Wamena one large live pig can sell for as much as 2 million Rupiah and pigs have widely become a source of cash income for many indigenous Jayawijayans.

From the wealth ranking exercises conducted by WATCH personnel with members of the CD groups in Kanggime and Kembu-Mamit it was found that people consider that the ownership of more than ten pigs indicates that a person is wealthy, ownership of between one and ten pigs was considered normal and those people who did not own any pigs were poor. From these group discussions it also emerged that most respondents generally aimed to maintain between four and ten sows at any one time.

Whilst in his controversial study “Pigs for the ancestors” Rappaport (1984) argues that pigs play an important role in Highland Papuan nutrition, particularly through the ceremonial slaughter and consumption of pigs as part of curing ceremonies and other feasts, most academics have rejected this view on the grounds that the human metabolism is not capable of processing large amounts of protein or fat if they are ingested in short binges. Instead it is widely accepted that pigs and the cycles of pig feasts serve social, economic, political, religious and ecological ends rather than nutritional ones. From this perspective pigs are important in the creation and display of wealth and prestige, the maintenance of bonds between individuals and groups, the maintenance of balance between the physical and spiritual realms and the continuation of trade relationships with more distant groups. It has further been suggested that in many Highland Papuan societies the maintenance of an ecological balance between humans, pigs and other organisms is a paramount, though often largely subconscious concern. In particular it has been observed that, whilst pigs are to humans with an important social, religious and trade commodity, they are also the main organisms that compete with humans for space and resources and increases in the local pig population place direct demands upon local agricultural systems and thereby act to increase the workload, particularly for women. Whilst the timing of the major pig feasts is ostensibly determined by big men according to social or religious imperatives, McArthur (1974: 91) suggests that the major pig feasts, where a large percentage of an areas pig population may be culled in a short period of time, may actual be a response to swine overcrowding and which is catalysed by pressure from women regarding their increasing workload.

Besides respecting their economic and social value, Lani people also display a strong fondness for their pigs and they are often treated like pets, being affectionately scratched or held, though there are no reports of piglets being nursed by women, as has been reported by some observers from other parts of the New Guinea Highlands. During the day pigs are allowed to roam quite freely and can forage in old gardens with little or no supervision. In the late afternoon they return to their *silimo* and women will feed them sweet potatoes and other food. During the night the pigs sleep in the lower level of the family houses. No special stalls are built for them and, although small pig yards are sometimes found within the environs of the *silimo*, pigs are rarely restrained in these. Pigs are also actively selected for breeding purposes and the majority of males are castrated, when they are around 40 cm tall, to make them fatter, make them less dangerous, and to prevent the less desirable males from mating.

On the downside pigs can cause considerable social, infrastructural and environmental problems because they are capable of damaging gardens, paths, fences, airstrips and eroding or polluting waterways. These problems often lead to direct economic losses for their owners as fines are widely sanctioned as the most suitable resolution of disputes about damage caused by pigs.

During the earlier phases of the project, WATCH personnel actively promoted the penning of pigs in order to overcome some of these problems. However, it was found that Jayawijayan communities were intensely resistant to the idea of penning their pigs. When we consider the complex relationships between men, pigs and their environment in the New Guinea Highlands and the way in which pig raising techniques are integrated into

local sweet potato production systems, it is clear that the introduction of such new approaches to pig raising would meet with considerable resistance. Penning pigs would require considerable changes in other aspects of their agricultural and social systems and would likely mean an increase in women's workload as they would have to carry more food home each day to feed the pigs. In this vein development approaches that advocate a more permanent system of gardening, such as the promotion of LEISA, are also likely to impact on an area's pig carrying capacity, as fallow gardens seem to be an important source of nutrition for pigs.

In the past, imported pigs were greatly admired in the Toli Valley. O'Brien (1969) reports that for a short time in 1963 an acculturation movement sprang up which espoused the need for the native "dark" pigs to be destroyed so that new "white" pigs could replace them. Several destruction feasts actually took place before mission preaching and an increasing reluctance to destroy their pigs ended the slaughter. Whilst Lani people still admire the size of introduced pigs, several abortive attempts at raising them in the Toli Valley or cross breeding them with native pigs have shown that these pigs are poorly suited to the local environment and local pig husbandry techniques.

Another problem concerning pigs in the Highlands of Jayawijaya concerns the human tapeworm that appears to have, possibly through some of the pigs introduced by missionaries, development agencies or the government, found its way into the Irian Jaya Highlands in relatively recent times. This parasite can live and reproduce within local pigs and can be transferred to human hosts if they eat undercooked meat from infested pigs. Once it has entered the human body the tapeworm can cause cysts in the brain or other organs, which ultimately lead to seizures and death.

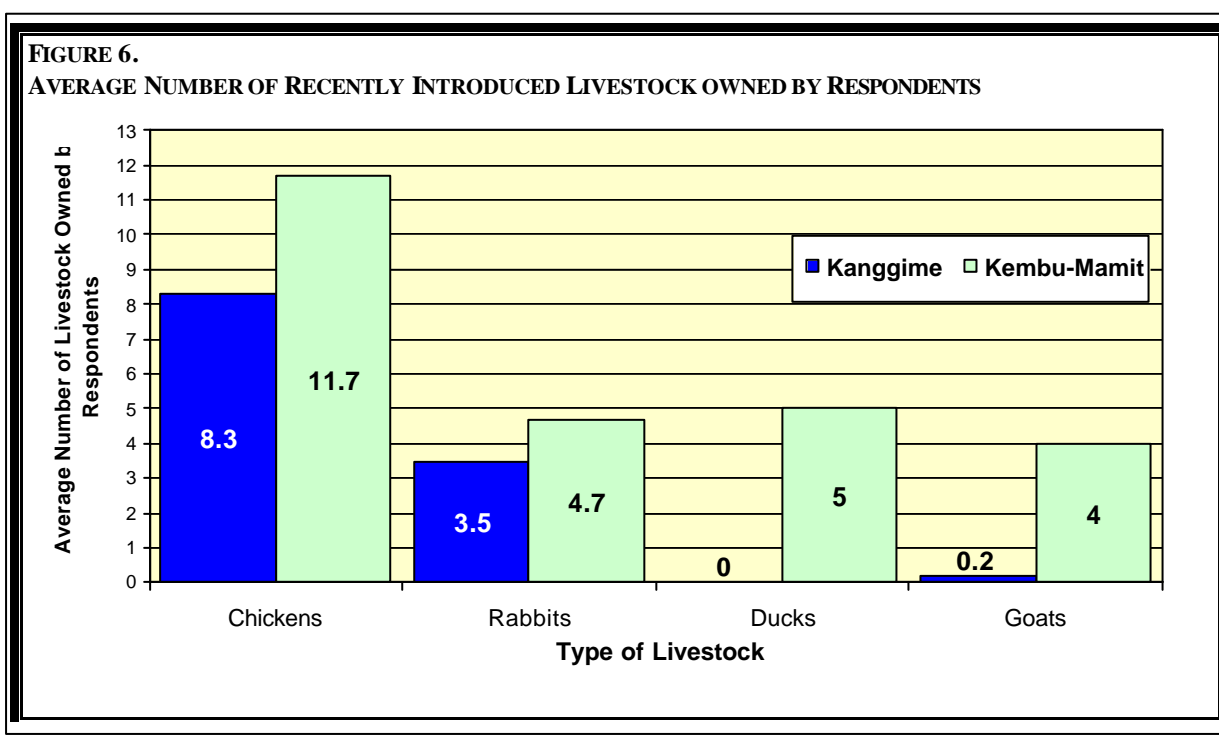
8.5.2 DOGS

Aside from pigs, dogs were the only other domesticated animals kept by the Lani prior to contact. Curiously enough, although pigs are held in the highest esteem and are often treated with considerable affection, the Lani seem to consider dogs and men to be more similar than pigs and men. Dogs are thought to have a spirit substance within them similar to the anenga or "soul" of a man whereas pigs are said to have none. Indeed Lani mythology accords the dog a special place, reflected in the story about the first man, pig, and dog who emerged from the ground. After they appeared man obtained propagules for taro, cucumbers, sugar cane, gourds and several other crops from the dog's ears while the pig contributed nothing to the original plant or tool inventory. Perhaps because of this belief in a canine soul, dogs are rarely eaten by the Lani though they seem to be increasingly used as sources of meat other parts of Jayawijaya when pigs or other livestock are unavailable. Instead, the main value of dogs is in hunting. Indeed, dogs are essential to Lani techniques for hunting most marsupial species as well as mountain cassowaries and wild pigs. The dogs are used both to smell and locate the game as well as to bring it down or corner it. The main role of men in this type of hunting is to be on hand either to deliver a death blow or to rip the game away from the dogs before they tear it to pieces. Dogs are also considered valuable for home security.

8.5.3 LIVESTOCK DIVERSIFICATION

The main objective of livestock diversification is to encourage regular protein intake since that protein sources are limited throughout Jayawijaya. Even at feast times, from a metabolic point of view we can argue that much of the ingested protein is wasted. Due to problems relating to ecological balance, competition between humans and pigs for food resources, and social and religious values (that largely determine patterns of pig consumption, see section II / 8.5.1), the expansion of existing pig rearing activities is not really an option for improving the protein content of Lani diets. Instead, introducing new livestock varieties is seen as a better approach for introducing small amounts of protein into the regular diets of Lani people. The new livestock varieties introduced by WATCH did not compete with humans or pigs for sweet potatoes and were not essential to religio-social feast cycles and exchanges. Furthermore, the new varieties of livestock aimed to provide communities with a range of alternative income generating options and various non-meat products such as eggs, pelts and feathers.

Aside from the introduction of new pig breeds (see section II / 8.5.1.), since the late 1950s the Toli valley Lani have been exposed to a wide variety of new breeds of livestock through trailing programs conducted by missionaries and subsequently through the Government, World Vision International Indonesia, WATCH and other parties. Whilst several of these new breeds, such as cows and sheep, have proved to be inappropriate in the target areas, others, such as rabbits, goats, ducks and chickens have been relatively popular. In order to get an idea of the popularity and extent of the new breeds the respondents to the baseline CD questionnaire were asked how many head of livestock they each possessed. The results were then averaged across respondents from each of the two sub-districts with the results displayed in figure 6. When analyzing this data we should be aware that the figures obtained from respondents are, if anything likely to be overestimates, both because a considerable amount of pride and prestige is associated with the ownership of livestock and also because



respondents may not be referring to the number of animals owned by them personally but instead to the livestock holdings of themselves and other close relatives, affines or *silimo* cohabitants with whom the lines of property ownership can be blurred. Despite these limitations, responses to this line of questioning can indicate the relative popularity of different types of introduced livestock in the target areas. Furthermore, discussions with respondents can also clarify some points regarding community perceptions of the new breeds.

Sheep

Around 300 sheep were introduced into the Yamo Valley during the late 1970s (Hayward, 1992: 360 – 362). By the early 1980s the World Vision development program introduced several flocks of sheep into the Kanggime and Karubaga. Unfortunately sheep proved to be ill adapted to the climate and local approaches to animal husbandry, and within a few years most sheep either died or were slaughtered and eaten by their disenchanted shepherds. A principle problems with sheep raising in the New Guinea Highlands lies in procuring enough leguminous fodder for sheep at altitudes lower than 2,000 metres. Furthermore, as the sheep raising techniques promoted involved penning the sheep and cutting and carrying suitable fodder to the sheep on a daily basis, people found the work far more onerous than their own conventional methods of pig husbandry. Sheep were not included in the survey questionnaire, as it had already been established that sheep raising had failed in the target areas, and whilst WATCH was, to a limited extent, involved in the distribution of sheep during the projects first two phases, during the Kanggime Extension the distribution of sheep was not included in the community development program.

Cattle

World Vision International Indonesia and the RBMU missionaries also introduced cattle into the Upper Toli Valley during the early 1980s. However, the extremely limited extent of flat land suitable for cattle ranching and extremely high transportation costs involved with getting the cattle to the nearest market in Wamena as well as local ideas about animal husbandry prevented cattle from ever taking off in the area. Once again WATCH considered cattle raising to be inappropriate in almost all areas of Jayawijaya.

Rabbits

Rabbit raising in the New Guinea Highlands was pioneered in the Tiom area by missionaries from the Australian Baptist Missionary Service (ABMS) during the 1970s and 1980s. From there, rabbits were disseminated across the Highlands of both Irian Jaya (and Papua New Guinea after one of the ABMS missionaries took up work with the PNG Agriculture Department). Despite the popularity of rabbit raising amongst missions, government departments and development agencies, the uptake of rabbit raising amongst many Highland Papuan communities remains quite poor. During the earlier phases of the project WATCH actively promoted rabbit raising and achieved considerable success, most notably in the Mapenduma area. However, as seems to be the case with many novelties, after an initial burst of interest and activity community interest in rabbit raising rapidly dwindled to a much lower level.

Figure 6 highlights that respondents in the Kanggime Sub-district own an average of 3.5 rabbits whilst those from Kembu-Mamit own 4.7. This suggests that rabbit raising continues to be practiced in the target areas but is not widely popular. Discussions with the survey respondent revealed that many people considered rabbit raising to be too much work, as they had to be kept in hutches and this compels the owners to cut and carry fodder to them on a daily basis.

Goats

While it is not certain, many presume that goats were first introduced into the Toli Valley in the early to mid 1980s when World Vision as well as the Indonesian Government began activities in the area. Goat raising is considered a high-risk activity in Highland Papuan communities. While there is a considerable market for goat in Wamena where many people enjoy goat, especially around the time of the Muslim festival of Idul Adha, the lure of cash to be made is offset by the risk of raising goats. Goats can easily jump or even chew through native fences and damage gardens within which can lead to high compensation costs for the owner of the goat. As a result, many people are wary of raising goats yet still, there were some CD groups who initiated goat raising.

In Kanggime, respondents owned on average just 0.2 goats each, suggesting that goat raising is not very popular in Kanggime. In Kembu-Mamit goat raising seemed reasonably popular as respondents claimed to own an average of 4 goats each. It is important to realise that most goats were actually owned by a small percentage of the respondents from either sub-district. Interestingly, the main reason cited for the attraction to goat raising was because goats, like pigs, required very little maintenance or supervision.

Chickens

Most likely, chickens were introduced into the Toli Valley almost immediately after the arrival of the first missionaries. Consistently but sporadically, chickens have been promoted by the government, missions and development agencies ever since. Throughout Jayawijaya Asian chickens are generally preferred to European breeds, primarily because they require less maintenance (they don't need to be fed or caged and will sleep in trees) but also because both their meat and eggs appear to be considered tastier, and thus more marketable by local Papuans and non-Papuans alike. The WATCH Project has promoted and distributed chickens to communities across Jayawijaya since the beginning of the project.

The major problems with chicken farming include protecting them from theft and stopping them from leaving their droppings around the home and on garden produce. This latter problem has been observed to repulse some people from eating produce grown near their villages. In order to overcome these problems and also raise improve the health of the chickens, WATCH has strongly encouraged caging chickens and has often provided tools and communities to aid with the construction of cages. However, very few groups across Jayawijaya appear to have adopted cages for their chickens as this increases the level of maintenance they

require. It is also interesting to note that eggs are rarely eaten or sold as it is considered more valuable to reproduce the chickens.

Results of the survey questionnaire support the idea that chickens were the most popular form of introduced livestock in the target areas. Respondents from Kanggime claimed to own an average of 8.3 chickens and those from Kembu-Mamit had, on average, 11.7 chickens. When questioned regarding what attracted them to chicken raising the majority of respondents expressed that the low level of maintenance required was the main attraction.

Ducks

Ducks were also probably introduced immediately after the arrival of the first missionaries in the Toli Valley. However, despite their ongoing promotion, duck raising has proved to be popular only in certain areas. During the first extension of the WATCH Project (1994-1997) duck raising activities were promoted in a number of areas and were most successfully in the Sela Valley (near Koropun), Mamit dan Manda.

As the results of the survey questionnaire shows, none of the respondents in Kanggime possessed any ducks whilst in Kembu-Mamit respondents owned, on average, 5 ducks each. From the discussions with respondents, we cannot understand the reasons for the disparity in relative popularity of ducks between Kanggime and Kembu-Mamit. The main reason given by respondents from Kembu-Mamit for the attraction of duck raising was once again, the low level of maintenance that they required.

8.6 MARKETS

8.6.1 TRADITIONAL AND TRANSITIONAL TRADE ECONOMICS IN THE TOLI VALLEY

Prior to the establishment of the first government and mission posts in Jayawijaya during the mid to late 1950s there was no cash economy in any Jayawijayan communities. Instead groups fulfilled most of their own material requirements through horticulture, hunting and gathering. Trade did however play an important role in pre-contact Jayawijayan societies both in providing access to a range of useful goods and, perhaps more importantly through its role in creating ties between individuals and groups and thus maintaining social relations in an ecological situation that made the development of social capital otherwise quite difficult. Trade and exchange were arranged around pigs, and cowrie, nyssa and bailer shells as well as a variety of other goods which were rare or not locally available such as stone axe blades, palm wood bows, and cakes of mineral salt. Men were the principle traders but women did have their own exchange items and systems.

During the pre-contact period the Toli Valley appears to have been part of an extended trade network centred around the stone axe mines near Mulia and the salt springs near Hitadipa in the upper Dugindoga Valley and Homeo in the mid-Kemandoga Valley. To the west this trade network also linked with routes via the Wissel Lakes area (in modern Paniai District) and on to the south coast, via which route most of the shells traded in the Lani territory seem to have entered the trade network. To the east Lani Trade seems to have reached at least as far as the Welesi area just south west of modern day Wamena. The main item that has been recorded as being

traded out of the Toli Valley is pigs, but given the fact that the Toli Valley Lani enjoyed reasonable access to foothill and lowland areas in the northern part of what is now Kembu-Mamit Sub-district, it likely that a range of lowland resources, such as the timber of the wild limbun palms and the medicinal bark of the Nggami cinnamon trees, were also regularly exported.

During the 1950s – 1960s, much of the traditional economy was quickly devalued as the fledgling missions invested heavily in the rapid development of infrastructure. In the course of constructing airstrips, mission stations, health facilities and schools large teams of local labourers would be employed. These workers were initially paid in shells but within a few years some areas had become so saturated with shells that workers began to refuse payment in shells preferring instead to receive trade goods such as steel axes, knives, spades and pots. In the case of the Upper Toli Valley, the economic influence of the missions continued to be strongly felt throughout the 1970s and 1980s, as the area became a major node in a system of inter-mission post vegetable trading.

Despite these influences, traditional trade and exchange patterns remain largely intact and have also evolved and linked in various ways with the emerging cash economy. For example, whilst the trade in stone from the Kembe Quarries near Mulia was significantly affected by the introduction of steel implements, and value of cowrie shells went through a period of massive devaluation in the early years of missionisation, both stone and shells have continued to have a high economic value in Jayawijaya, both because of their ongoing ceremonial and decorative value, but also because they can be made into traditional artifacts and sold for cash to tourists and collectors. Furthermore, the departure of the missionaries in the late 1980's and early 1990s caused a considerable contraction of the cash economy in the Upper Toli Valley that would have caused many Lani to rely more on their traditional forms of subsistence and exchange economics. Conversely, cash does not appear to have become an important or integral commodity in Lani exchange systems, as has been the case in some areas of the PNG Highlands where cash is now a standard part of bride wealth and other exchange payments.

Despite the persistence of traditional economics most local peoples now feel a need for access to cash, most importantly to pay for school and health service fees, but also to pay for goods such as clothing, tools and utensils and foodstuffs including salt, cooking oil, sugar, cigarettes, tea and coffee. Unfortunately, most Lani people find it difficult to fulfill their aspirations for access to cash income and material goods because market opportunities and cash employment are both extremely limited. Consequently, the overwhelming majority of the inhabitants of the Toli Valley remain principally engaged in subsistence agriculture with some practicing limited cash cropping for the local markets in Kanggime, Kembu, Mamit and Karubaga, and/or the district level markets in Wamena. Only a few dozen individuals in the target area have formal employment with the churches, the health service or other government or non-government institutions.

8.6.2 THE DISTRICT ECONOMY

Today the cash economy of Jayawijaya remains very small. There are no mines (though several companies have been prospecting in the area for some time) and large-scale timber extraction is not feasible due to the

difficult terrain and the remoteness from ports and markets. The only commercial centre is Wamena, which has a population, of around 60,000, most of whom are employed by the government or in the retail, service, and home industry and construction sectors. The very small size of the market in Wamena and the lack of road links from there to other major centers in the province has acted as the main impediment to the expansion of cash cropping in Jayawijaya.

During the 1970s and 1980s a major development program, the Joint Fund for the Development of Irian Jaya (JDF) was involved in marketing produce from agricultural development projects in Jayawijaya to the Freeport Mining communities in Timika and Tembagapura. Whilst this arrangement worked for some time Freeport ultimately found it more expedient to source their fruit and vegetables from suppliers in Cairns, Australia and the trade between Jayawijaya and the mining towns diminished to a trickle. A number of local (mostly non-indigenous) traders are engaged in shipping highland vegetables, mostly potatoes, cabbage, cauliflower, carrots and beans, from Wamena for sale in Wamena or beyond. This trade remains very small and those engaged in it are very protective of their niche. Other government economic development programs are implemented in Jayawijaya, but to date these have focus on the agricultural sector in areas easily accessible from Wamena. Government assistance to the more remote areas like Kanggime and Kembu Mamit is limited to various forms of direct grants to each *Desa*, which in the absence of technical advice and supervision amount to little more than handouts, and the provision of emergency relief.

Despite the limited economic opportunities on offer, each year Wamena draws increasing numbers of Lani people from the North Baliem, Upper Hablerifori and Toli Valley areas. Lani settlements are found scattered around the edge of Wamena, and although we do not have any accurate figures, there would appear to be at least several thousand Lani living more or less permanently in or around Wamena and many more will come and stay for shorter periods.

Many of these people come to Wamena to seek education at the senior secondary level or in post secondary schools. They either stay in dormitories or with relatives who live in villages on the edge of town, and support themselves through growing vegetables, working in the informal sector and assistance from their home villages.

As very few Lani people are able to find work in the formal sector, the great majority of those who arrive in Wamena are forced to seek work in the informal sector. The main types of work in which they are likely to become involved include: vegetable trading in the markets (a sector which the Lani have come to dominate since non-indigenous Jayawijayans were excluded from trading in the vegetable markets), trishaw driving (a sector which has also been specifically protected by the government as a source of income for indigenous students), and/or as home help. There are Lani women also working in Wamena's sex trade. These women do not so much approach prostitution as a profession but rather as a passing form of income generation. As has also been observed in the PNG Highlands, whilst women's involvement in the sex industry is looked down upon by other members of their communities, so long as their productive and reproductive capacities are not impaired, it does not appear to be a major obstacle to their returning to the village and marrying. Since AIDS was detected in Jayawijaya in the early 1990s, the involvement of Lani women in the sex trade has been a

considerable concern for health and development workers.

Besides Wamena, many Lani are also drawn to the larger commercial centres at Timika and Jayapura. Whilst we have no data available on the number of Toli Valley Lani absent from their community at any one time, we can assume that the absence of large numbers of young people from the villages does constitute a considerable drain on local labour reserves.

8.6.3 SUB-DISTRICT LEVEL MARKETS / LOCAL MARKET RESEARCH

Within the target areas the only formal markets where primary producers can sell their produce are held for three half-days each week at the near the airstrips at Kanggime, Mamit and Kembu. The market days are normally Tuesday, Thursday and Saturday mornings. On market days many people will travel from the villages into the market centers, not only to sell their produce but also to purchase manufactured goods, such as cooking oil, salt, and MSG, from the non-Lani traders located around the market and to meet and talk with other people.

The WATCH Gender & Development Assistant conducted market research surveys in two main markets held in Kanggime and Mamit to get an idea of the availability and prices of various local and imported goods at these markets. The GAD assistant attended both markets on four separate market days between January and May 1999. She found that the most common item offered for sale in both markets and in every visit was oranges. In the early hours of the day the oranges were sold in piles of two for Rp.100 and as the day wore on prices were reduced to 3 oranges for Rp.100. It is apparent that large numbers of orange trees have already been planted and are bearing fruit in the Upper Toli Valley. Mandarins, which have generally been more widely planted across Jayawijaya, were also sold in the markets but there were far fewer offered for sale and, due to many locally grown mandarines being produced from seed rather than by grafting off superior varieties, many mandarins tasted quite sour and were consequently being sold at much lower prices.

Due to fluctuations in their availability, the price and availability of sweet potatoes at the markets varied considerably during the market research period. Between January and March very little sweet potato was sold at the market and prices were as high as Rp.4,000.- to Rp.5,000.- per bag. In April and May, after one of the larger biannual harvests, the availability of sweet potatoes at the market increased dramatically and prices dropped by around 50% to as low as 2,000.- to Rp.3,000.- per bag.

Peanuts were also sold at the markets on all of the days the research was conducted. The peanuts were sold in bunches tied together by their stalks which were still attached and were pre-boiled for immediate consumption. Prices varied considerably depending on the size of the bunch and the number of other people selling them on that particular day. Prices also varied throughout the day. However, most bunches of cooked peanuts were sold for between Rp.100.- and Rp.500. There were some uncooked peanuts that were sold in larger bunches for around Rp.1,000 and this price did not change over the course of the market research period however the size of bunches did vary depending upon supply.

Cassava was also a regularly item in the markets. Several tubers were sold at a time for Rp.1,000 per pile. At the time of this research, the price of cassava in Kanggime and Mamit had risen dramatically compared to research done by staff in WATCH II. This price rise may have come about in response to the popularity of a type of rolled pancake made from cassava flour also often seen being sold in the markets.

Whilst previous market research indicated that taro was rarely sold in the Kanggime and Mamit markets, latest research showed that taro was often being sold there for around Rp.1,000 per large tuber, roughly equivalent to the price of taro in the market in Wamena. Boiled taro or fried taro snacks were not seen being offered for sale in the two markets.

Unlike the market in Wamena, there was neither a large quantity or diversity of green vegetables being sold in the Kanggime and Mamit markets. The main vegetables in these markets included sweet potato leaves, choko leaves, choko fruits and occasionally cabbage. A variety of both plantain (cooking) bananas and table bananas were sold on each market day. Compared to market research done in WATCH II, the price for bananas had risen considerably. Three bananas sold for Rp.100 whilst a large hand of bananas could fetch between Rp.1,000.- and Rp.2,000.

Besides local produce a variety of manufactured goods were being sold in the small stalls or kiosks around the edges of the market area. Most of these kiosks are run by non-locals; including teachers, government personnel etc. They are often open for business outside of market hours but much of their trade takes place on market days. The prices being charged at the Mamit market for the four most popular manufactured goods are summarized in table 11. From this table we can see that the prices of manufactured goods in Mamit is generally between 200% and 350% more expensive than the price charged for the same goods in Wamena. This price difference is caused by the high cost of transporting goods to Mamit combined with the fact that demand for these products tends to outstrip the rate of supply, which means that sellers can increase their profit margins by raising their prices.

TABLE 11.
PRICES OF THE MOST POPULAR STORE GOODS IN WAMENA & MAMIT

NAME OF ITEM	QUANTITY	PRICE IN WAMENA	PRICE IN MAMIT
Refined salt	250 grams	Rp 1,000	Rp 3,500
"Bimoli" Cooking Oil	0.25 ltr	Rp 3,000	Rp 6,500
Monosodium Glutamate (MSG)	Packet	Rp 1,000	Rp 3,500
"Supermie" Instant Noodles	Packet	Rp 1,000	Rp 3,500

The main recommendations to emerge from this market research is that citrus cultivation techniques in the target areas should be improved with a view to marketing oranges and mandarins in Wamena and possibly beyond. In particular people should be taught how to select superior varieties of citrus and how to graft from these trees onto seedling grown trees. More attention should also be paid to the introduction and improvement of other varieties of fruit, both for sale in the markets and also for personal consumption.

8.7 STANDARDS OF SOCIO-ECONOMIC WEALTH AND WELLBEING

Evaluating social well-being amongst Lani communities is not easy. The types of indicators used by government agencies to evaluate or monitor levels of social wealth or well-being, such as the minimum wage standards (*Upah Minimum Regional - UMR*) applied by the Department of Labour, the Minimum Physical Requirements (*Kebutuhan Fisik Minimum – KFM*) system used by the Division of Social Welfare, and the Welfare Infrastructure (*Prasarana Kesejahteraan - Prasejahtera*) system used by the National Family Planning Body (BKKBN) are problematic when used in Jayawijaya. This is because in Jayawijaya, these models' indicators bear little relevance to the social, economic or environmental context.

As an alternative WATCH worked with the target communities by applying Participatory Learning and Action (PLA) methods. This led to a more locally appropriate system of indicators for the rapid evaluation of local levels of wealth and well being which included:

- The number of pigs owned by the family;
- The number of garden sits and garden beds that the family can work at any one time;
- The diversity of crops being cultivated by the family, and in particular the diversity of new and economically productive crops such as peanuts, coffee, etc.,
- The number and diversity of introduced breeds of livestock owned by the family; and
- The level of formal education achieved by their children.

Recent research into Lani social conditions, such as that done by Zadrach Wamebu (1995) and Ir. Caecilia from the International Potatoes Centre (CIP) in Bogor, supports the results of these wealth-ranking exercises. Both researchers have concluded that the numbers of pigs owned by a family and the extent of their garden holdings are the key indicators of social and economic well-being in highland Jayawijayan communities. Despite various other changes in the Jayawijayan economy since the introduction of cash, such as the dramatic devaluation of the shell currencies, pigs continue to be a very real and relevant indicator of wealth and well-being. This idea is illustrated by the observation that a considerable percentage of the cash income of most Lani people is reinvested into pigs.

If we are to use pigs as a primary indicator of social wealth and well-being then we must be aware that community perceptions of pig ownership are more complex than those of outside observers. It might be hard for an outsider to calculate 'pig wealth' because locals often calculate the number of pigs owned as including the pigs owed to other people (either as repayment of loans or other obligations) and the pigs they will gain (in forthcoming exchanges).

The ability to finance a child's education, which seems have only relatively recently become a meaningful social indicator for Lani people, also requires access to considerable cash resources and therefore does tell us something about that families economic well-being.

It is also significant to note that many community members considered a relationship with a development project, such as the WATCH Project itself, indicate wealth. This symbol of wealth may be extended to include relationships with tourists or other people who can potentially send goods to people when they leave Jayawijaya.

In order to make this system of indicators for the rapid evaluation of local levels of wealth and well being easy to apply and understand, a fairly simple system of ranking was developed based upon the indicators already established. This ranking system has only three levels: wealthy or *eggiwarek*; normal or *opnolonggun*; and poor or *enggilek*.

The results of a participatory wealth ranking exercise conducted in the *Desa* Woraga are displayed in table 12. These results show that the distribution of wealth across this community is relatively even, with 81% of respondents being ranked as being either wealthy or poor, 6 families or 16.3% being ranked as poor and just 1 family or 2.7% being ranked as wealthy.

In order to cross check the findings of the participatory wealth ranking exercises, 20 questions were identified to determine which of the social well being indicators each respondent could be said to have met.

The results of this short questionnaires suggested that most respondents were in the *opnolonggun* class. Compared to the participatory wealth ranking exercises, the number of families ranked as 'wealthy' was greater and the number who were 'poor' appeared to be lower. The difference between the results of the quantitative approach (questionnaires) to group wealth ranking exercises as opposed to the more qualitative and participatory approach could be attributed to people overstating their actual material wealth in the surveys, as they feel embarrassed to show their lack of material wealth to project staff. Such overstatements cannot be so easily made in a group situation where the presence of many people help act as a cross check on the each other's responses.

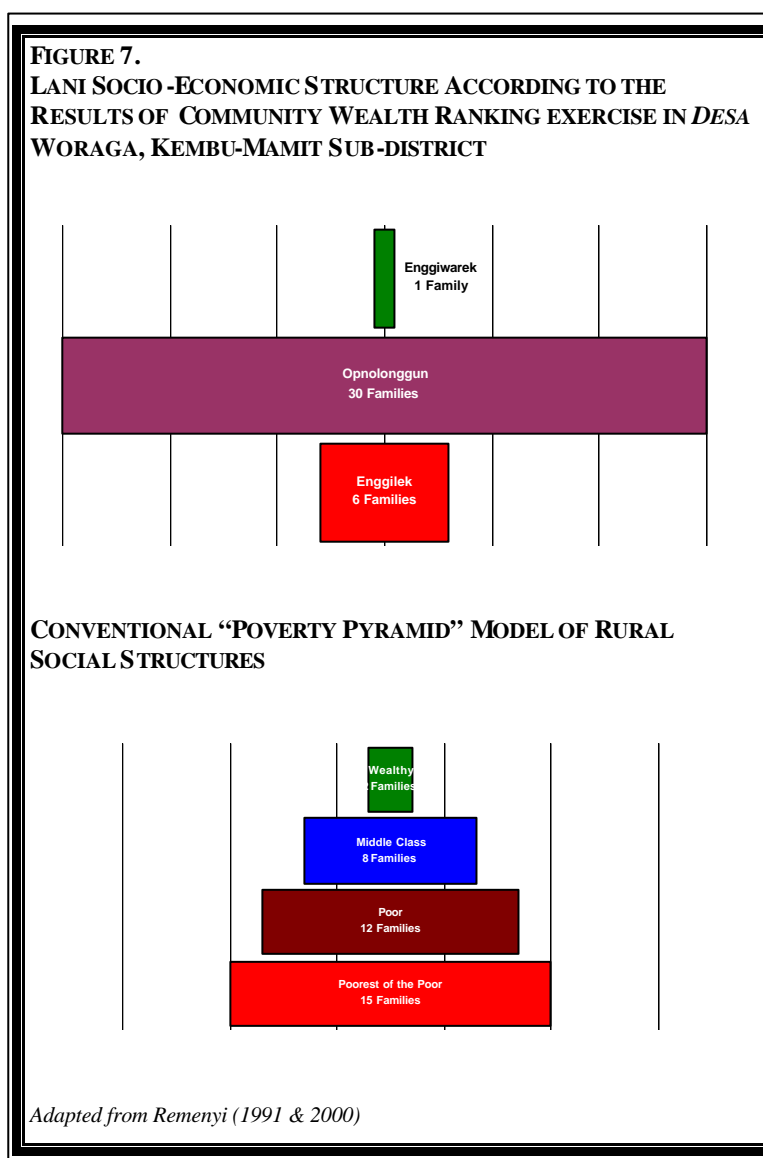


TABLE 12.
WEALTH RANKING FOR THE DESA WORAGA, KEMBU-MAMIT SUB-DISTRICT

RANKING	INDICATORS		RANKING OF THE RESIDENTS OF DESA WORAGA (37 FAMILIES)
	PAST INDICATORS OF WEALTH & SOCIAL WELL-BEING	CURRENT INDICATORS OF WEALTH & WELL-BEING	
1. <i>Enggiwarek</i> (Wealthy)	<ul style="list-style-type: none"> • Was a powerful warrior • Owned many pigs (more than 10) • Was married to many women • Owned many gardens sites & even more garden beds (3 or more garden sites) 	<ul style="list-style-type: none"> • Owns more than ten breeding age pigs • Owns several varieties of introduced livestock • Owns many gardens sites & even more garden beds (3 or more garden sites) • Plants a range of new crop varieties in their gardens • In one month may earn in excess of Rp.200,000.- • Has several different sources of income • Has a relationship with funding sources (donors) • Has the wherewithal to send their offspring to school and university. 	1 Family
2. <i>Opnolonggun</i> (Normal)	<ul style="list-style-type: none"> • Possessed 10 or less breeding pigs • Only had 1-2 gardens 	<ul style="list-style-type: none"> • Owns less than ten breeding age pigs • Does not own any introduced livestock • Owns between 1 and 3 gardens sites • Only has occasional access to cash income • Only able to finance the education of their children as far as senior high school level. 	30 Families
3. <i>Enggilek</i> (Poor)	<ul style="list-style-type: none"> • Did not possess any pigs • Only had gardens 	<ul style="list-style-type: none"> • Does not possess any pigs • Only has sweet potato / taro gardens • Does not have any introduced crops or livestock. 	6 Families

In either case, the picture that we get of the socio-economic hierarchy in Lani communities is quite flat and, does not conform to the more conventional models of rural socio-economic hierarchies that have emerged from social theories developed in areas like rural Java and Bangladesh. This is demonstrated in figure 7, which compares the outcomes of the wealth ranking exercise in the *Desa Woraga* with the “poverty pyramid model” developed by Joseph Remenyi (1991, 2000). Whilst the differences between WATCH’s findings and the poverty pyramid type model may be in part caused by the limited number of hierarchal levels used in WATCH’s system, these findings still point to the fact that within most Highland Papuan societies wealth / resources tend to be much more evenly distributed across the community than is normally the case many other rural societies in Asia.

9. COMMUNITY DEVELOPMENT GROUPS

During the initial phase of the WATCH project, community development groups were organised along *Desa* lines. It was soon apparent that drawing community development groups from church parishes was more locally appropriate and managerially expedient. Whilst parish based group structures have proved to be far superior to the use of *Desas*, their cohesiveness and effectiveness have been challenged by their sheer size, by the fact that they can cut across far too many social structures and because they have not been adequately established in many areas. An examination of the work of Larson (1989) and Hayward (1992) highlights how parish structures have often been established at the confederacy level of social organization. The confederacy itself is far from being a homogenous and cohesive unit (see section II / 4.1.4). Indeed within each confederacy two sub-confederacies and a number of lineages exist, each of which is comprised of the residents of one or several *silimos*. Within each of these categories of social organization we will also find a number of men vying for the position of pre-eminent “*big man*”. It is at the confederacy or parish level that men must wield considerable influence to motivate most or all community members to act corporatively whereas at the level of the lineage or *silimo* cooperation between group members is quite common. Being conscious of these issues, WATCH has continued to use the parishes as the basis for group formation, as these are the most well organized and externally accessible structures existing amongst Lani communities. Moreover even though this would almost certainly raise levels of group participation, it is not logistically feasible to establish groups based on individual lineages of *silimos*,

By the time that the field data collections for the baseline survey were being completed, members of the WATCH Gender & Development team were still involved in properly establishing community development groups and registering their members. They were experiencing problems with people not actually registered as being residents of the church parish while young children of primary school age were being registered as group members. Furthermore, problems and confusion arose as some local people were signing up as members of WATCH groups as well as in the World Vision International Indonesia’s Area Development Program also operating in the area. Whilst these problems were quite quickly resolved, the unforeseen delays meant that some survey activities that targeted the group members and that aimed to gather baseline information could not be carried out as planned. Alternative approaches had to developed as part of the mid-term survey. The advantage of the initial conflict between WATCH and World Vision activities was that it helped to alert project staff at an early stage of the need for better communication, coordination and cooperation.

10. GENDER ANALYSIS

Addressing and reducing the problems relating to gender relations within the target communities is considered to be an important element of the project's strategy. After all, such problems have a significant impact on the health and welfare of women and children. Even so, no specific field survey activities which may have established a clearer picture of the situation in regards to gender issues amongst the target communities were conducted as part of the baseline survey. This was because questionnaires were deemed an inadequate method to collect data about gender and more appropriate methods (such as in-depth interviews, case studies and focus group discussions) were not possible given the time and labour constraints involved in survey activities. Despite this lack of field data, by drawing on information derived from secondary sources as well as information collected during earlier phases of the project and in recent observations of the target communities, project staff have been able to establish a reasonably detailed picture of the main gender issues affecting the health and well-being of women and children in the target areas. Some of this material has already been discussed in other sections of this report, but it is useful to recapitulate such material and draw it together within the concept of Gender and Development (GAD) theory.

10.1 DUALISM, GENDER CONSTRUCTION AND COMPLIMENTARITY

As can be seen from Hayward's diagram of Lani cosmology (reproduced as Figure 102 in Annexe IV. of this report) the Lani worldview is organized dualistically. It has been widely observed that such dualism structures Melanesian conceptions of gender more generally and that throughout Melanesia there is a strong distinction between men and women's social roles and responsibilities. Further, it has been noted that amongst the Highland Papuan communities gender duality is not simply given but rather is a state of affairs that must be continuously constructed and reconstructed through ritual (such as initiation ceremonies and "cult" activities) and through socialization (ie. education and upbringing). Gender roles themselves are not fixed but dynamic as, by means of group discussions and people's actions, they remain open to constant evaluation and alteration.

It is very important to note that the sharp segregation between men and women in almost all Highland Papuan societies does not mean that the genders are in conflict. This assumption has been the conclusion of many outsiders, especially when viewed through the paradigm of western feminist and/or GAD theory. In contrast to the views of outsiders, most Highland Papuans view their relationships with the opposite sex as complementary. For example, after her fieldwork amongst Mid Grand Valley Dani Leslie Butt writes:

"[W]hen men invoke the saying, 'women are like the veins that hold the blood; if they burst we die,' or 'women are like a forked stick that holds up a tree,' they are talking not only about men's dependence on women to reproduce and to nurture, but they are also referring to her inalienable position as producer of food and tender of pigs." Butt (1998: 95)

Emphasizing indigenous views of complementarity between the sexes is not to deny that Lani gender constructions may impose a variety of limitations upon the lives of both women and men that may have considerable negative implications for the health and well-being of Lani women and children. Nor is it to

deny that there may be individuals within Lani societies, particularly amongst the younger generations, who may desire certain elements of gendered relationships altered or destroyed. By stressing complementarity and not conflict we are able to revise Lani ideas of gender as something other than essentially “bad”. We can see that any changes to the gender relationship will have to be generated from within the community through ongoing social dialogues in response to changing social and economic circumstances, rather than being imposed externally by NGOs, government departments or others. Furthermore, the strong interrelationship between male and female gender roles means that any changes or development interventions which target either one of the genders is likely to impact considerably on the opposite gender and may result in unforeseen negative outcomes for one or both of the gender groups.

In this light, WATCH staff viewed their roles in the process of gender change amongst the Lani as being analogous to the role of an action research facilitator. The project was able to provide a variety of forums within which men and women could discuss gender issues, and it provided inputs of technology and information by which certain changes might be effected. The project was not able to, by itself, force the extent or pace of gender role change in Lani societies.

10.2 BRIDEPRICE OR BRIDEWEALTH & THE CONTRACTING OF MARRIAGES

Marriage in Highland Papuan communities is invariably attended by some form of payment or exchange. Whilst in some societies such exchanges may take the form of direct exchanges of brides between groups, amongst the Lani (as well as most other Highland Papuan groups) marriage entails the exchange of pigs or other material goods²¹. In the past this practise was referred to as ‘bride price’ or ‘bride purchase’ but more recently terms like ‘bridewealth’ and ‘marriage exchanges’ have become more popular. While the term ‘brideprice’ implies that women are bought and sold in a fashion similar to other tradable goods, the more recent terms rightly recognise that what had previously been considered a one off payment for a bride was in fact only one exchange in a lifelong and reciprocal series of exchanges between and within both the husband’s and wife’s patrilineages. Therefore it may be harmful to undermine this institution since that it not only helps to redistribute wealth between and within patrilineages, but by acting as a strong impediment to conflict between the groups the practise of bridewealth also fosters political and social stability. We must remember that in this sense, ongoing marriage exchanges serve a very important function in a social and environmental setting where social capital is extremely difficult to generate.

The existence of ‘brideprice’ in Highland Papuan communities has contributed to the belief that marriages are arranged by men for economic ends which in turn is taken as evidence of gender imbalances against women. In contrast to this widespread belief, during her time amongst the Lani O’Brien noticed that:

“The (L)ani say that choices of marriage partners are expressed and primarily made by women, meaning the bride and her mother. Although this is not a norm which can be easily tested statistically, the origin of many marriages is explained by saying ‘She wanted him for her husband’ and it is clear that both young girls and mature women

21 In her doctoral dissertation on Konda Valley Lani marriage payments, O’Brien (1969: 407-8) describes the three most important exchange items associated with marriage in the Karubaga area as being pigs, woven strips of cowrie shells and male and female *jao* stones. However, she also states that the *jao* stones were absent from the marriage payments which she observed around Kuttime and Kangime.

have considerable freedom in rejecting potential or [divorcing] actual husbands.” (O’Brien, 1969: 383)

Yet she notes that despite women’s control in choosing and rejecting men for marriage:

“Implicit in [men’s ideas of marriage arrangements] is the idea that however much “choosing” the bride and her mother engage in, the ultimate decision in marriage – at least in a woman’s initial marriage – is made by a male.” (O’Brien, 1969: 413)

It appears that amongst the Toli Valley Lani marriages are not necessarily arranged by men, although a woman’s father or brother may be able to exert a right of veto over a woman’s choice of husband. In contrast to O’Brien’s analysis of the contracting of marriages amongst Toli Valley Lani communities, Leslie Butt’s (1998: 94 - 100) description of marriage amongst Mid Grand Valley Dani communities implies that men enjoy much greater control over the arrangement of marriages and that economics and alliance building take precedence over a young woman’s desires. However, Butt notes that even amongst the more conservative and male dominated Grand Valley Dani societies, women are able to thwart the best laid plans and marital machinations of men by running away, eloping with other men or formally divorcing their husband. In fact data from various parts of the New Guinea Highlands suggest that formal and informal divorce rates are generally between 30% and 50% of all marriages with almost all divorces initiated by women.

In the light of this and other evidence supporting the idea that women have control over who they marry and divorce, it is extremely difficult to sustain the argument that Lani and many other Highland Papuan women are subordinated through the arrangement of marriages by men. Furthermore, bridewealth or marriage exchanges are an important means to generate social capital and some would say, enhance respect for the social and productive value of women. As such development activities should not attempt to change bridewealth as its abolition could contribute to a breakdown of the social order.

10.3 PATRILINEALITY, POLYGyny, THE EXTENDED FAMILY AND VIRILOCAL SETTLEMENT PATTERNS

Patrilineality and polygyny are also aspects of Melanesian culture that have been considered to contribute to gender imbalances and the disempowerment of women and as such, altering these kinship structures has been a focus of many government, NGO and mission activities. Supporting the view that patrilineality and polygyny causes the disempowerment of women however has been difficult in light of evidence to the contrary. For instance, women in societies that can be described as ‘matrilineal’ can suffer poor health along with women in ‘patrilineal’ societies. Moreover power, social status and health varies between women in both kinds of societies. Efforts to promote the nucleation of Highland Papuan families can also be based on flimsy premises. Outside agents have sought to transform extended families into nuclear families because, they argue, the needs of women and children are more likely to be neglected in the context of an extended family. For a start the shape of a family has more to do with the ownership, management and distribution of resources and extended families encourage the sharing of resources. Secondly, men’s caring and providing qualities is more a function of their individual temperaments and their fondness for their wives than it is of their role in a family. Lastly, there have been many who have observed that extended families are beneficial for women and children. In an

extended family women have access to other female kin for childcare, assistance with gardening work etc. while children enjoy the presence of many women to care for them.

Having said this virilocal settlement patterns, or the practise of a bride taking up residence with their husband's patrilineage, may be a major contributor to women's disempowerment. The act of being separated from your own kin can not only serve to leave a woman feeling isolated, lonely, lacking in emotional and practical support but may even leave her at risk of becoming a scape goat for problems affecting the group. This is particularly the case when women marry into a group that has no other women from their patrilineage in it. In these cases, the situation can have negative implications for women's health and well-being. Because virilocal settlement patterns are well entrenched, it would be more fruitful to identify these marginalized women and provide them with more support to enable them to raise their own status in the group.

10.4 THE DIVISION OF LABOUR & THE HEAVY WORKLOAD OF WOMEN

As can be seen from the description of the division of labour in section II / 4.1.3, work roles in Lani societies are quite sharply divided between men's and women's work. In general men's work is physically strenuous (ie. opening gardens) and is limited to short bursts of activity interspersed with long periods of non-physical "work" including organizing the social and political worlds. Women tend to work less strenuously, but constantly.

The high value placed upon women's productive and reproductive capabilities is a double edged sword. On the negative side, the reliance on women to tend to the gardens, pigs and children makes it quite difficult for them to attend formal educational institutions much beyond primary school because to send high school age females away to Wamena or elsewhere in order to attend school represents a much greater loss of labour than is the case if males go away to school. Similarly their reproductive capabilities encourage men to curtail the further education of women and keep them in the village once they reach puberty, or certainly once they become married, as it is often feared that prolonged attendance at schools is likely to result in unwanted pregnancies or other problems. In addition, their workload can make it hard to adequately care for babies and infants.

On the other hand the high value placed upon women's productive and reproductive capabilities bestows upon women a high social status and enables them to control social relationships through their control of sweet potatoes and pig production. Even though the disposal of pigs is still ultimately in the hands of men, many scholars on Melanesia now believe that few men can make decisions regarding the disposal of pigs without seeking approval from their wives.

It needs to be recognized that even though the physical workloads of Lani women is great, much greater than that of most western women, Lani women still enjoy considerable amounts of 'free' time and they maintain control of their own work schedules. This is in contrast to most 'modernised' women whose work may be less strenuous but entails longer working hours, lack of control over when to work, and another shift of domestic labour (often called the second shift) when they get home.

In this context development / government workers must weigh up how their initiatives may impinge upon

the workloads of women and their access to and control over the outputs of production. All too often, community or economic development activities have negatively impacted on women and children's health by making their workloads greater and more time consuming. Alternately, projects that result in decreasing women's workloads have served to lessen women's social status and influence over socio-political affairs. Therefore development activities should strive towards increase the productivity of women whilst reducing their workload. They should also be designed to help women control more commercially viable activities whilst ensuring that the subsistence base is not undermined.

10.5 FEMALE POLLUTION & TABOOS

Beliefs that dangerous spiritual pollutants emanate from women's genitals and bodily secretions, such as menstrual blood, is widespread across the New Guinea Highlands. Such beliefs can manifest in a wide variety of forms including: the isolation of women for a period after childbirth and/or during menstruation; the exclusion of women from men's houses and the construction of raised floors in women's houses to stop contamination of the earth below. Fear of female pollution can lead outsiders to conclude that Melanesian men are misogynistic because they see women as dirty. Many scholars advocate an alternate explanation as they believe such reasoning obscures more complex social understandings. Female pollution can be understood as recognition that women have innate powers and capabilities. Analysis of the central role accorded to female fertility in most male cult activities across Melanesia support this idea (Jorgensen 1983). The issue as to whether female pollution beliefs are detrimental to women's health is a complex one. For instance pollution related taboos can prevent women from eating certain foods and this obviously has poor repercussions for women's nutrition and thus, health. However other pollution-related taboos, such as the bans placed on women working when they are menstruating or for several weeks after childbirth, can have positive effects on women's health.

10.6 THE ROLE OF WOMEN AS MEDIATORS OF CHANGE

A great deal of the gender and development literature has focused on improving women's health and wellbeing because they represent a subordinated and impoverished group in lesser-developed countries. More recently, scholars have tended to treat women more as agents in the development process. Far from seeing them as passive, women are coming to be seen as more motivated to improve the health and future prospects of their children than men, and having a greater capacity for labourious work and thrift. Moreover, women are more likely than men to share the benefits of development with their children and families.

This trend towards seeing women as change agents and mediators of social and economic development has influences the work by Ien De Vries (1988). De Vries suggests that women are the driving force of the social and technological change in the Konda Valley area. De Vries builds upon Phloeg's (see section II / 4.1.5) theory of societal intensification due to environmental stress and upon O'Brien's idea (see section II / 4.1.7) that Konda Valley Lani women are motivated to be open to innovation to reduce the risk of a sorcery accusation. It is clear that women need to be accorded the status of social innovators and not just aid recipients. The WATCH project was pioneering in that it encourages the establishment of more formal women's empowerment and development institutions in Jayawijaya.