

CHAPTER 4 - RICE PRODUCTION IN PNG

CHAPTER 4 THE STUDY AREA / FIELD

4.0 Central Province

4.1 Brief Description of Study Area

Central Province is the first area that was chosen for this study. The study covered the National Capital District for the urban rice consumer survey. Central Province is bordered to the east by the Milne Bay Province, to the north and north-east by Morobe and Oro Provinces respectively and to the west by Gulf Province. (*Refer to the locality map of PNG*).

Abau and Kairuku Districts of the Central Province were the two rural districts covered in the survey. Abau District is located to the east of the National Capital District (or Port Moresby), while Kairuku District is located to the west.

Within each of the districts, two sites were selected for the study. In the Abau District, Amau and Tutubu villages were selected and studies were carried out respectively. In the Kairuku District, the areas of Kubuna and Bakoiudu were selected with emphasis placed on Idoido village in Kubuna and Yumuna village in Bakoiudu.

There are two highways linking the two study sites to Port Moresby. The Magi Highway connects the study sites at Amau and Tutubu villages in the east, while the Hiritano Highway in the west provides access to the Kubuna and Bakoiudu study sites.

4.1.1 Overview of Rice Survey in Two Districts of Central Province

Four villages were selected and surveyed in two selected districts of the Central Province. Ten rice farmers or intending rice farmers were selected in each selected village. They were interviewed using survey questionnaires supplied by JICA. Rice gardens were also visited followed by samples of rice harvests weighed and recorded.

The observations recorded in the following pages are results of interviews of rice farmers and key people in the surveyed villages and districts, measurements of garden areas and harvested rice, observations of crops in the food gardens and review of existing rice production records in DAL headquarters in Konedobu in the National Capital District.

Table 4.1. Two districts in Central Province showing LLGs and villages surveyed

Districts	LLGs	Villages surveyed
1. Abau	- Cloudy Bay	1. Tutubu 2. Amau
2. Kairuku	- Mekeo Kuni	1. Idoido (in Kubuna) 2. Yumuna (in Bakoiudu)

Source: JICA Rice Farm Survey, March 2002

4.1.2 History of rice growing in Abau District

Some old rubber settlers in the area recalled rice being first grown in the 1960s by the first rubber settlers on government land in the Cape Rodney area of Abau District. The original rubber resettlement blocks of the Ianu and Cocoalands subdivisions were set up by the Australian Administration for retired servicemen of the colonial army in PNG.

In the early 1980s the DAL staff in Moreguina station grew rice as an experimental crop. Some DAL staff claimed that a good yield of rice was produced, milled and distributed to

station staff for cooking and taste sampling. No record was made on the variety planted and yield obtained.

At about the same time, rice was also grown by the center's manager of Philippine nationality, at the Marshall Lagoon Vocational that is located next to the Cocoalands Subdivision station, as a food crop for boarding students. When he left PNG in 1990, rice growing was not continued by the national manager due to lack of skills and knowledge in rice production.

In 1991-92, rice was grown in an abandoned portion of land that was planted originally to rubber within the Cocoalands Subdivision of CRADP. A national DAL staff carried out several trials on yields of available rice varieties under upland and irrigated conditions. Irrigation water was pumped from a 150 mm ground bore that was installed earlier to supply drinking water for rubber settlers. Results of the trials were promising.

In 1994 to 1995, Trukai Industries Ltd took over the rice trial plots in Cocoalands. Trukai established several demonstration plots on rice-based farming systems (RBFS) in line with the recommendations of Sloane, Cook & King Pty Ltd, a rice consulting company from Australia that did a feasibility study on rice in 1993 in Central, Morobe and East Sepik Provinces of PNG.

In 1996, Trukai transferred all staff and farm machinery to Lae after failing to secure a lease on the land for rice farming experiments in Cocoalands Subdivision from the Department of Lands & Physical Planning.

In 2000 rice seeds were distributed to subsistence food growers in Tutubu, Amau, and Gavoune, the three villages in the Abau District. Food growers of Gavoune village have food gardens in the riverbanks at the mouth of Lako river starting from Kelerakwa village that is situated on the western side of the Marshall lagoon opposite the Kupiano wharf. For two years the paddy was not milled due to lack of rice mill in the area. A rice mill was finally provided by NDAL to the Kupiano District office this year.

During the 1980s, a portable rice mill, Satake SB2B, was brought in from the DAL machinery shed in Gabaka Street in Gordons, NCD by the provincial staff of the Department of Primary Industry (DPI) for milling rice in Moreguina station and in the Marshall Lagoon vocational center. Details on rice growing practices and cropping patterns in Abau district are shown in Table 4.7 & 4.8 of this chapter.

4.1.2.1 Rice Growing Experience in Tutubu village of Abau District, Central Province

Tutubu village is a coastal village that is connected by a feeder and a provincial road to the Magi national highway. It is 45 kilometers northeast of Kupiano station, the administrative center of Abau District of Central Province.

In 2000, a crop of rice was planted in Tutubu village. In late 1999, DAL nominated a farmer leader to attend a two-week training course in rice growing. The course was run outside Port Moresby at the Mirigeda Agricultural Training Centre which is operated by the Central Provincial DAL. Upon completion of the course, he was given rice seeds to take back to his village. He was encouraged to raise awareness amongst the Tutubu farmers by seed distribution and demonstration of rice planting in small plots as food crop.

The Tutubu community is socially organized. The President of the Cloudy Bay LLG is a resident of Tutubu village. The village has a committee officer, a peace officer, and an active resident pastor of the Seventh Day Adventist (SDA) Church, with the only chapel in the village. Most of the young married farmers have been educated up to high school level and are articulate with their opinions and expectations for the Tutubu community. The village has a double classroom, an aid post building currently under construction, a public pit latrine toilet, and three roof and-water tank units for collecting drinking water for the community.

Despite all these attributes, it is interesting to note that there is no trade store in Tutubu. The nearest trade store is in Lalaura village which is seven kilometers away and could be reached by foot. A one-kg packet of rice costs K2.50 in Lalaura village. Tutubu households claimed that polished rice is a rare food item that is eaten only once a month. This is the main reason given by interviewed respondents why they are keen to grow rice in Tutubu village.

This community accepted the idea of growing rice as a food crop quickly and decisively. Altogether, 60 farmers planted and harvested rice in small plots in 2000. It was noted that these farmers received little or no assistance from the Abau District Administration and the Cloudy Bay LLG Office in Kupiano station in this food production project.

Rice was threshed manually by hand, sun-dried and finally dipped in water to remove rubbish. It was then packed in bags and kept in the house while waiting for extension officers for advice. Some households hulled the dry rice with mortar and pestle for cooking and eating or was used as chicken feed.

DAL extension officers had not visited the Tutubu community even up to the time of this survey. According to the extension officers, extension visits were not possible because of lack of transport and unavailability of funds from the Kupiano District Administration.

The survey team examined and weighed several samples of rice bags. Farmers were further advised to keep the dry rice until a rice mill becomes available. All of the 10 interviewed farmers and those present were keen to plant rice in 2002. They requested for a portable rice mill to be sent to Tutubu village because of the difficulty in moving paddy rice for milling in Kupiano.

4.1.2.2 Rice growing experience in Amau village

Rice growing was introduced in 2001 in Amau village. In late 1999, a farmer was selected to attend the same short training course in Mirigeda Training Centre. He was given rice seeds in late 2000. He had distributed small amounts to fellow subsistence farmers in Amau. Up until this survey, he is the only rice grower in Amau village. Other farmers are hesitant to commence rice planting until after they saw that the first farmer's harvest is milled. This attitude was probably reinforced by the lack of visit by District Administration and LLG extension officers from Kupiano station.

Amau village is located 53 kilometers northeast of Kupiano station along the last stretch of the Magi national highway. It is also 21 kilometers southeast of Moreguina station, the headquarters of the former Cape Rodney Agricultural (Rubber) Development Project where the government rubber factory is located. This factory closed down in May 2000.

Amau village is a contrast to Tutubu village not only in rice growing but also in community organization, rural health and nutrition matters. Mothers and children in Amau village appear to suffer from malnutrition. A good number of children appear to be undernourished and have

skin ulcers and diseases. The village has no pit latrine toilets; domestic pigs are not put in pig pens; the United Church chapel is falling apart and the ward councilor resides in Moreguina station. It was apparent that the only active community resident is the farmer who is growing rice. Every subsistence household it seems is pre-occupied with trying to survive in this slow-moving community.

The ten households who were interviewed indicated their desire to plant rice in 2002. However, they asked for seeds and a rice mill to be made available. Amau village is considered a good case to study, as it offers the challenge on how to get the laid-back subsistence farmers to adapt rice growing in their subsistence gardens.

4.1.3 Production Technology and Yield in Two Surveyed Villages

4.1.3.1 Tutubu village

Small plots were cleared and cultivated by hand from two-three year old fallowed patches of kunai (*Imperata Cylindrica*) in higher ground and pitpit (*Saccharum spp*) in low areas. Rice was planted as an upland monocrop. Seeds were drilled in rows 30cm apart. No fertilizers, compost, farm or green manure were applied. Weeding, harvesting, threshing and sun-drying were done manually. On plots with better soil, a ratoon crop was harvested with very low yields that are less than half of the first harvest.

During dry spells, some plots in high ground are watered by hand from shallow wells dug beside the rice plots. Low-lying plots beside sago swamps are usually not affected. The water table in these places continue to remain high at less than a meter even after a few weeks without rain. After harvesting, rice plots reverted to grass fallow. Yield was 0.825 metric tonne/hectare which is very low for upland condition because of very low nutrient reserve and the soil texture in the area.

4.1.3.2 Amau Village

Rice is planted also as an upland monocrop in small clearings from fallowed areas of secondary forest regrowth. Method of planting is the same as in Tutubu village. Yield in Amau village from the only rice garden that was planted for the last two years was 1.870 metric MT/ha. This yield is higher than in Tutubu village but is still low for upland condition. This is because of low to medium soil nutrient reserve and the shallow topsoil in the area planted to rice. For comparison of production technology and yields in two surveyed districts refer to Tables 4. 7, 4. 8 ,4. 9 and 4.10.

4.1.4 History of rice growing in Kairuku District

In 1891, the Roman Catholic missionaries from Yule Island introduced rice growing in small upland plots, in the Kairuku District. Rice was cultivated as a food crop for the missionaries who came and established the first mission station in the Papuan mainland at Veifa'a village. (Hale, P. R. 1975. *Rice in PNG, Agriculture in the Economy. Review Paper Series, DPI, PNG*)

Upland rice growing spread to the surrounding villages in Northwest and Northeast Mekeo in the late 1920s and in the mid 1930s. Up until now, upland rice is still planted as the initial food crop whenever new subsistence gardens are cleared from fallows of secondary forest regrowth. Upland rice production with a tall red rice variety was assimilated easily and permanently into most subsistence gardens in inland Mekeo because of its simple method of cultivation. This red variety is still grown in inland Mekeo villages at present.

Between 1936 and 1942, the Catholic Mission station kept the upland production in subsistence gardens going by purchasing the paddy rice from the growers and milling it for food for the mission. The subsistence growers were quite happy with small paddy yields and the small but prompt payment given by the missionaries for paddy rice.

In 1948, the colonial Director for Agriculture held discussions with local landowners to grow rice on a large commercial scale on customary land using farm machinery to be supplied by the colonial government. This move was one of the several attempts in the past to increase rice production in customary land with farm machinery for cultivation and processing.

Since 1921, the colonial government introduced farm machinery such as tractors with implements, combine harvesters and rice mills from Australia in attempts to increase production. It is reported that there were four major attempts in the Mekeo floodplains at mechanized commercial upland rice production by the colonial Australian Administration during the years 1921-34, 1942-45, 1948-56, and 1970-74. (McKillop, R. F. 1976. A History of Agricultural Extension in PNG, Extension Bulletin No. 10, DPI, Port Moresby, pp. 20-22)

Rice production reached a peak of 800 tonnes from 243 hectares in 1974. But in 1975, the entire rice crop was lost due to a prolonged wet season. (Hale, P.R. 1975, op.cit, p. 13). No further attempts to grow rice under mechanized upland conditions were made during the decade after 1975. In late 1980s government and political planners of the Independent State of Papua New Guinea thought they had found the solution to previous field problems associated with mechanized upland rice cultivation in the upcoming Bereina Rice Project.

All four attempts by the colonial administration had failed to establish a viable commercial rice in the Bereina area due to persistent farm machinery problems, very dry or overly wet weather conditions, and very low returns to high costs of production using farm machinery.

4.1.5 Bereina Rice Project Study, 1989-1994

4.1.5.1 Project Background

In 1989, NDAL launched the Bereina Rice Project in the Kairiku District of the Central Province. This project was considered feasible because of the large flat fertile arable land and abundant rainfall in the Mekeo flood plains as well as experiences in mechanized upland rice growing in the district.

The Bereina Rice Project was funded by the GoPNG as part of the Public Investment Programme (PIP) under the NDAL Grain and Rice Project. It aimed to establish smallholder mechanized commercial upland rice farms in the Mekeo floodplains. The GoPNG encouraged the involvement of landowners in rice cultivation under upland conditions in extensive flat grasslands through the provision of farm machinery and agricultural credit. Agricultural credit was provided for costs of hiring tractors from PTB or local owners and two large combine harvesters from NDAL and other costs of production. (See Tables 4.3 & 4.5)

The Bereina Rice Project was also the result of joint efforts by NDAL, the then newly created provincial Department of Primary Industry (DPI), the Agricultural Development Bank (AgBank) of PNG, and to some extent the Plant & Transport Board of Department of Works (PTB-DOW). A significant participant who joined toward the later part of project implementation was Trukai Industries Pty Ltd which is also a major rice importer in PNG.

The management staff for the project was provided by NDAL. AgBank administered the rice loan. Provincial DPI provided the extension staff. PTB-DOW supplied additional six government tractors for land preparation and seed planting. Rice Industries purchased all paddy rice harvests in 1992 up until 1994 and took over management of the DAL rice shed and rice mill in Bereina station. It milled, packed, advertised and sold the milled rice under the brand name Bereina Rice through its marketing outlets and facilities. In 1993, an MOA was signed between the Independent State of PNG and Trukai Industries. Its aim was to formalize the milling and marketing arrangements, use of government land in the Cocoalands Subdivision in Abau District for a demonstration farm on irrigated rice-based farming system, and the funding of the Joint PNG-IRRI Rice Research and Training Program from 1994-1996.

Bereina Rice Project officially closed down in 1995 when the Agriculture Bank of PNG (AgBank) withdrew from the joint MOA with DAL following the closure of the AgBank Branch office in Bereina station due to cutback in government funding and AgBank staff by PNG government.

This project started off well in 1989 with a good harvest of 52 metric tonnes from 27 hectares. Production reached its peak in 1992 with 285 metric tonnes from 165 hectares, declined in 1993 with 204 metric tonnes from 155 hectares and dropped in 1994 to 10 metric tonnes from 7 hectares.

Even with the concerted efforts of the government and the business sector, the Bereina Rice Project failed to establish a viable smallholder mechanized rice industry in the Bereina floodplains. A drastic drop in paddy production was experienced due to prolonged drought that started in mid-1993 and continued with uneven and less than average rainfall in 1994 onwards. Low paddy production for the 1993-94 crop resulted in the worsening of non-payment of production loans by rice growers and fewer loan applications processed for 1994. Constant breakdown of old PTB and village-owned tractors during land preparation and the resulting poor germination of seedlings in 1994 due to very low rainfall had contributed to the problem. The closure of the AgBank branch office in Bereina in 1995 due to downsizing of government institutions was the final blow. Below is the paddy production record of the Bereina Rice Project.

Table 4.2. Rice Production Record of the Bereina Rice Project

Crop Year	No. of rice farmers	Area (ha) Planted	Area (ha) harvested	Yield (MT)
1989-90	10	27	27	52
1990-91	26	116	116	164
1991-92	44	170	165	285
1992-93	66	258	155	204*
1993-94	5	12	7	10**

Source: Food Security Branch, DAL, 1995

* Production went down due to low rainfall during reproductive stage of crop.

** Due to drought, machinery breakdown, late planting, and weed infestation.

4.1.5.2 Investments of PNG Government and Business Sector in Bereina Rice Project

During the period 1989-94, rice production by so-called commercial smallholder growers in the Mekeo floodplains was a result of infusion of cash and material investments from the government and the business sector in the form of project staff, transport, farm machinery, and agricultural credit in the Bereina Rice Project. Agricultural credit through the AgBank was extended in unsecured annual loans. Only the projected rice harvest was pledged by each loan applicant as chattel mortgage in the loan agreement. From the business sector, Trukai Industries invested company funds in the purchase of dry paddy rice, milling, packaging, and marketing of Bereina Rice and its by-products such as broken rice and bran in Port Moresby.

The production of rice under the Bereina Rice Project was an expensive exercise on the part of the government, its institutions and the business sector. The actual cost of each kilogram of paddy rice brought in at the Bereina rice mill gate or each kilogram of milled rice sold at the supermarket shelf in Port Moresby did not reflect the actual costs of production that were subsidized by the government and the business sector. Details of annual costs of investments from the government and business sector in the Bereina Rice Project are shown in Tables 4.3, 4.4, 4.5, and 4.6.

Table 4.3. Summary of Capital & Annual Recurrent Costs of Bereina Rice Project.

1. DAL COSTS:		
Items	Capital Costs (K)	Recurrent Costs (K)
a. Permanent project staff		
- 1 DAL Project manager x K10,500@		10,500
- 2 DPI Extension officers x K7,500@		15,000
b. Casual project staff:		
- 1 mechanic x K 150/fn x 26 fn		3,900
- 1 clerk typist x K125/fn x 26 f/n		3,250
- 6 farm machinery operators x K90/fn@		14,040
- 4 general laborers x K65/fn		6,760
c. Project transport		
- 1 Toyota Hilux 4wd d/cab	40,000	5,000
- 1 Toyota Hilux 4wd s/cab	35,000	5,000
d. Farm machinery:		
- 4 PTB tractors, wet hire		20,000
- 1 4wd tractor	45,000	5,000
- 2 Claas combine harvester	(Purchased 1972)	10,000
- 1 Satake SB10B rice mill	(Purchased 1972)	5,000
- 2 portable rice threshers	1,000	200
e. Total Revolving Fund deposited w/ AgBank	203,000	40,200
g. Average annual cost of purchase of dry paddy ie K40,600/2 years (from Table 4 below)		20,300
Total	324,000	123,950
2. AGBANK COSTS		
a.- 1 staff in Bereina Branch x K7,500@		7,500
3. TRUKAI INDUSTRIES COSTS		
a. Seasonal manpower for Bereina rice mill		
- 1 supervisor salary + travel costs, 1 month		3,500
- 4 mill labourers		720
b. Average annual purchase cost of dry paddy ie K110,500 / 3 years (from Table 4 below)		36,830
c. Ave. annual milling/packaging/marketing costs		5,000
Total		46,050
GRAND TOTAL	324,000	177,500

Source: Food Security Branch, DAL- 1995

Table 4.4. Costs of purchase of dry paddy at Bereina station rice shed.

Crop Year	Yield (MT)	Price (t) /kg	Annual Costs (K)	Paid by
1989-90	52	15	7,800	DAL
1990-91	164	20	32,800	DAL
1991-92	285	20	57,000	Trukai
1992-93	204	25	51,000	Trukai
1993-94	10	25	2,500	Trukai

Source: Food Security Branch, DAL, 1995

Table 4.5. Costs/hectare of rice production loans from AgBank for Bereina Rice Project

Production inputs	(K) Costs/hectare
Land preparation	120.00
Seed	20.00
Planting	15.00
Fertilizers	44.25
Chemicals	25.00
Labour – weeding	50.00
Materials ie bags	50.00
Harvesting	30.00
Cartage	15.00
Total	369.25

Source: PPBD (ERPPC, PPC), DAL, 1989

Repayment of loan proceeds extended by AgBank to smallholder rice growers for tractor repair and rice production was poor during the entire period of the Bereina Rice Project. (Table 6 below). In 1990, loans extended to eight rice growers for the repair of old tractors to be used in the project had a very low recovery rate. From the start, most of the tractors were too old to be repaired. Only three tractors were repaired to working condition and were hired out for a limited time for land preparation. But only one tractor owner paid off the loan for tractor repair costs with money received from sale of paddy rice. Very low paddy rice production in areas where rainfall was inadequate during critical periods of growth of the upland crop resulted in poor repayment of loans.

Table 4.6. Recovery rates of agricultural loan funds, Bereina Rice Project.

Items funded by revolving fund in Agbank from DAL	Total amounts Released	Amount repaid by farmers	Percentage of Loans recovered
Repair of 8 local tractors	K 28,500.00	K 3,000	10.53 %
All rice production loans	K 155,000.00	K 43,500	28.06 %
Total	K 183,500.00	K 46,500	25.34 %

Rural Development Bank of PNG (Agbank), 1995

4.1.5.3 Smallholder Rice Growers Equity Share in Bereina Rice Project

The small holder rice growers in the Kairuku district contributed customary land for rice planting and farm household labour (“sweat equity”) for crop management, drying, and bagging.

4.1.5.4 Conclusion on the Experience of Bereina Rice Project

The Bereina Rice Project was another costly government investment exercise that did not produce the desired results and was not sustainable. The deployment of farm machinery and agricultural credit in upland farms with unreliable rainfall and the tapping on the existing expertise and financial assistance of the business sector in milling, packaging and marketing the milled products did not prove conducive to long term sustainability. In the end, Bereina Rice Project failed to establish a viable commercial rice industry in the Mekeo floodplains. In 1995 when DAL, AgBank, and Trukai Industries pulled out of Bereina station for economic reasons, mechanized upland production on customary land came to an end in Kairuku.

4.1.5.5 Rice Production in Kairuku District after the Bereina Rice Project

Subsistence food growers in inland Mekeo floodplains particularly in the Northeast and Northwest Mekeo have been growing upland rice as the initial crop in newly-opened food gardens in bush fallow clearings long before mechanized rice farming was introduced in the area by the government or by religious missions. When the Bereina Rice Project closed down in 1995, subsistence rice production continued in remote inland places of Kairuku District. Subsistence growers planted the traditional red rice variety and the introduced TCS-10 in small family gardens beside riverbanks. They use wooden mortar and pestle to remove the rice hulls. Rice is considered a staple in their diet along with bananas and sweet potato. To date, subsistence rice growing is well-established in Apanapi, Piunga, Amiaka, Miaru, Ioi, Engefa, Ma-akunga, Veifa'a and Amoamo of inland Mekeo and in the areas of Kubuna and Bakoiudo in the east.

DAL set up two pilot irrigated rice farms in Aviara-Oreke and Mainohana in 1996 and 2000 respectively in the coastal Kairuku area near Bereina station. Both farms were situated in unutilized customary land. A total of five hectares were cleared, leveled, bunded and developed with irrigation canals using earthmoving plant and farm machinery and technical supervision from DAL. DAL provided irrigation pumps, fuel and all costs for land preparation. As "sweat equity", land owners contributed traditional bush materials for fencing in Aviara-Oreke; labour for planting, weeding and harvesting in Mainohana. Both farms gave reasonable rice yields and cash returns to landowner farmers. The costs of land preparation and irrigation was covered entirely by DAL. Income on the initial yield was used in the production of the next crop. However when DAL pulled out government farm machinery in these two pilot farms, the landowners could not sustain land preparation and irrigation activities and the project stopped.

4.1.6 Rice Crop production technology.

Table 4.7. Technology of Rice Crops in the surveyed villages* and the other rice-growing villages in Abau and Kairuku districts of Central Province.

District	Villages that Planted rice	Year Planted	Type of cultivation And land preparation	Type of crop	Method of Planting	Source of Fertility
1. Abau	1. Tutubu*	2000	Shifting/slash & burn	Upland	Dibbling	Fallow
	2. Amau*	2000	Shifting/slash & burn	Upland	Dibbling	Fallow
	3. Cocoland	1991	Sedentary/mechanized	Irrigated	Transplant	Fertilizer
	4. Merani	2001	Shifting/slash & burn	Upland	Dibbling	Fallow
	5. Manabo	2001	Shifting/slash & burn	Upland	Dibbling	Fallow
	6. Moreguina	1982	Sedentary/mechanized	Irrigated	Drilling	Fertilizer
	DAL station					
	7. Ianu High School	1992	Sedentary/mechanized	Upland	Drilling	Fertilizer
2. Kairuku	8. Marshall Lagoon Vocational Centre	1982	Sedentary/mechanized	Upland	Drilling	Fertilizer
	1. Idoido*	1947	Shifting/slash & burn	Upland	Dibbling	Fallow
		2001	Shifting/slash & burn	Upland	Dibbling	Fallow
	2. Bakoido*	2002	Shifting/slash & burn	Upland	Dibbling	Fallow
	3. Bereina	1989	Shifting/mechanized	Upland	Drilling	Fertilizer
	4. Mainohana	1989	Sedentary/mechanized	Upland	Drilling	Fertilizer
		2001	Sedentary/mechanized	Irrigated	Transplant	Fertilizer
	5. Aviara-Oreke	1995	Sedentary/mechanized	Irrigated	Transplant	Fertilizer
	6. Kiburi	1991	Sedentary/mechanized	Upland	Drilling	Fertilizer
	7. Inawi	1935	Shifting/mechanized	Upland	Drilling	Fertilizer
	8. Inaoae	1935	Shifting/mechanized	Upland	Drilling	Fertilizer
	9. Jesubaibua	1935	Shifting/mechanized	Upland	Drilling	Fertilizer
	10. Aipiana	1891	Shifting/slash & burn	Upland	Dibbling	Fallow
	11. Inawaia	1935	Shifting/mechanized	Upland	Drilling	Fertilizer
	12. Avai	1991	Shifting/mechanized	Upland	Drilling	Fertilizer
	13. Veifa'a	1891	Shifting/slash & burn	Upland	Dibbling	Fallow
		1992	Shifting/mechanized	Upland	Drilling	Fertilizer
	14. Amoamo	1891	Shifting/slash & burn	Upland	Dibbling	Fallow
		1991	Shifting/mechanized	Upland	Drilling	Fertilizer
	15. Eboa	1991	Shifting/mechanized	Upland	Drilling	Fertilizer
	16. Inawabui	1992	Shifting/mechanized	Upland	Drilling	Fertilizer
	17. Hisiu	1991	Shifting/mechanized	Upland	Drilling	Fertilizer
	18. Naragabadi	1991	Shifting/mechanized	Upland	Drilling	Fertilizer
	16. N/W Mekeo (10 villages)	1935	Shifting/mechanized	Upland	Dibbling	Fallow
			Shifting/slash & burn			

Source: JICA Rice Farm Survey, March 2002 & Food Security Branch, DAL

Table 4.8. Gardening practices, average area and yield for upland rice in four surveyed villages in two districts in Central Province.

Districts	LLGs	Villages	Upland practices	Average area/ rice garden	Average yield/ hectare (ha)
1. Abau	Cloudy Bay	1. Tutubu	a. Grass fallow b. Nil fertilizer c. Dibbled seed d. Monocrop	0,0176 ha	0.825 MT/ha
-do-	-do-	2. Amau	a. Forest regrowth b. Nil fertilizer c. Dibbled seed d. Monocrop	0,0750 ha	1.870 MT/ha
2. Kairuku	Mekeo Kuni	1. Idoido (Kubuna)	a. Forest regrowth b. Nil fertilizer c. Dibbled seed d. Monocrop	0,0470 ha	1.178 MT/ha
-do-	-do-	2. Yumuna (Bakoiudo)	a. Forest regrowth b. Nil fertilizer c. Dibbled seed d. Monocrop	Yet to plant.	Yet to harvest

Source: JICA Rice Farm Survey, March 2002

Table 4.9. Number of rice farm households and area planted in four surveyed villages in two districts of Central Province.

Districts	LLG	Villages Surveyed	Year planted	No. of rice households	Total area planted (ha)	Total yield (M/T)
1. Abau	Cloudy Bay	1. Tutubu	2000	60	1,060	0.871
-do-	-do-	2. Amau	2001	1	0.750	0.140
2. Kairuku	Mekeo Kuni	1. Idoido	2001	15	0.710	Not yet
-do-	-do-	2. Yumuna	2001	10	Yet to plant	Not yet

Source: JICA Rice Farm Survey, March 2002

Table 4.10. Status of insect pests, weeds, diseases and soil degradation in subsistence gardens in two districts of Central Province

Rice crop threats	Current status	Observations in rice gardens visited during survey
1. Insect pests	Insignificant	Ricebugs (<i>Leptocoriza oratorius</i>) & leafhoppers (<i>Cnaphalocrosis medinalis</i>)
2. Weeds	Insignificant	Nutgrass (<i>Cyperus rotundus</i> L.); canegrass; <i>Rothelia exaltata</i>
3. Diseases	Insignificant	No disease symptoms due to crop rotation and fallow period.
4. Soil degradation	Insignificant	Controlled naturally through minimum tillage & fallow period

Source: JICA Rice Farm Survey, March 2002

Table 4.11. Seed multiplication and distribution in two rice districts of Central Province

Supplier of rice seeds (Who multiplies certified seed?)	Procurer of seeds (Who obtains seed from supplier?)	Distributor of seeds (Who distributes to farmers?)
Republic of China (Taiwan) Agric. Technical Mission, Bubia, Lae, Morobe	National DAL c/o Food Security Branch, Konedobu, NCD	District Agriculture Program Coordinator, Kupiano, Abau Dist, C.P.

Source: JICA Rice Farm Survey, March 2002

Table 4.12. Extension Support System for Rice Production in two rice districts of Central Province (National, Provincial, District, and LLG levels).

Level	Function	Possible source of rice promotion funds	Dev't Budget allocated to rice promotion	Remarks
-National DAL	- Coordination	-Food Security Program K2.2 M for 2002	- K 130,000	- For 13 Provinces producing rice.
-National Department of Rural Dev't.	-Budget support for district rural dev't projects.	-Annual grant allocation K1 M/local M.P.	- Nil	- LLG/JDPBPC to prepare submission for rice promotion.
- Provincial DAL Advisor	- Coordination	- Nil	- Nil	Nil
- District DAL Coordinator	- Supervision	- Abau District Budget - Annual grant allocation	- Nil - Nil	- Nil -LLG/JDPBPC to prepare submission for rice promotion.
-LLG Extension Officers	Implementation	- Local Revenue	- Nil	-Funds are used for administration costs of 3 LLGs.

Sources: Food Security Branch, DAL; Abau (C.P.) District Administrator & LLG Manager, 2002

Legend:

1. DAL = Department of Agriculture and Livestock
2. LLG = Local Level Government, the basic political unit in PNG government.
3. JDP&BPC = Joint District Planning and Budget Priority Committee, a district planning committee consisting of the District Administrator, local M.P., LLG presidents, and local prominent representatives.
4. M.P. = Member of Parliament.

4.1.7 Direction of Progress in Rice Cultivation.

- a. Results from surveys conducted in two selected districts indicate that rice growing as a food crop is expected to spread in 2002 in the Mekeo Kuni LLG in Kairuku district and in Cloudy Bay and Amazon Bay LLGs in Abau district.
- b. There is a strong interest from government-run educational institutions in Abau district ie Kupiano High School and Marshall Lagoon Vocational Centre to grow rice as a food crop for boarding students. These institutions will provide rice training and seeds to students who will take them to their respective villages for planting.
- c. For purposes of long-term sustainability of rice growing in the four surveyed villages, it will require a portable micro mill and a stationary medium-size rice mill to be based in Kupiano station of the Cloudy Bay LLG in Abau District and in Kubuna DPI station of the Mekeo Kuni LLG in Kairuku District. The DAL through the Food Security Branch has provided a stationary rice mill for Kupiano Station and a portable micro-mill for Kubuna DPI station in Idoido village.
- d. The expected increase in number of rice farmers and area planted is driven by the necessity of subsistence farmers to grow rice as a food crop. The desire to eat rice is the motive for growing rice and not the need to get cash income.
- e. A provincial rice resource center is required for seed multiplication and training of farmers and extension officers in Central Province. The old Kubuna Agricultural Station is an ideal site for this center in terms of costs of renovation and rice resource farm development at Idoido village.

4.1.8 Recommendations for two surveyed districts

- a. An additional unit of micro mill Model RM-150 should be purchased with funds from either national DAL or Department of Rural Development - Annual Grant Allocation to M.Ps (K1million). This portable unit can produce polished rice at 150 kg/hr. Two men can carry and load it in a utility vehicle, dinghy or double-canoe.
- b. Certified rice seeds should be distributed in 2002 to villages in Amazon Bay LLG in Abau district and in Mekeo Kuni LLG of Kairuku district.
- c. At least one motorbike should be made available for the district & LLG extension officers so that they can conduct extension visits on a weekly basis to villages in the targeted LLG. The District Administration can provide fuel and maintenance costs for motorbike or motorized dinghy.
- d. The villages of Tutubu and Amau in Abau district and Idoido & Yumuna in Kairuku district are recommended to be model villages for growing rice as a food crop for farm households and small livestock. Notwithstanding the criteria for selecting model villages for rice production, these four villages represent both extreme ends in rice promotion in Abau district; Tutubu being the most receptive and Amau the most resistant to change, Idoido an ideal place for a provincial rice resource center for hands-

on training and demonstration and Yumuna a marginal location for upland rice production.

- e. One extension officer and four farmer leaders from each surveyed district should be sent to OISCA Training Centre in Rabaul, ENB for rice training course in 2002.
- f. The District Agriculture Coordinator should prepare a 5-Year Rice Farm Intermediate Mechanization Program for Abau and Kairuku Districts for submission to the JDP & BPC for funding request. National DAL to assist him in preparing this program.
- g. A detailed site investigation should be conducted in the Kubuna area of Kairuku district for a proposal on a Kubuna Provincial Rice Resource Centre for Central Province. Refer to attached Appendix 2.

4.1.9 Analysis of Rice Production Experiences in the districts.

Based on past experience where mechanized rice cultivation in the Bereina floodplains had failed to establish a commercial rice industry, future rice project proposals by the GoPNG, NGO, or aid donor should involve a large base of local farm households who account for more than 95 % of the rural population. The long term sustainability of the project will be driven not so much by the limited project inputs provided at district or national level by government agencies, NGOs or aid donors but largely by the need of the subsistence farm households to produce food for themselves. Table 4.13 below illustrates the differences between subsistence rice farms and smallholder commercial rice farms in PNG.

Table 4.13. Comparison of subsistence rice gardens and smallholder commercial farms

Criteria	Subsistence rice gardens	Smallholders commercial rice farms
1. Source of motivation	Subsistence farm households	Government departments/institutions
2. Project impact	Widespread in the long run	Limited in the short term
3. Extent of mobilization	Nearly all subsistence gardens	Applicable only to households with 1+ha farmholdings
4. Government subsidies	Minimal ie rice mills, hand tools	Substantial capital+recurrent costs as at Bereina Rice Project
5. Investment recovery	Possible 50 %-60 % and easy	Rate of 20 %-30% and difficult
6. Project sustainability	Dependent on farm household needs	Dependent on project funds
7. Project applicability	Nearly all locations in PNG	Only in accessible large flat plains
8. Environmental effects	Minimal & natural methods	Can be extensive & costly to manage

Source: JICA Rice Farm Survey, March 2002

4.1.9.1 Farming Systems: upland production system

When asked about the number of gardens (farms) cultivated, including cultivation of rice in the past years and during the survey period, the responses showed that out of the 40 respondents or households covered, on the average, there were 3 food crop gardens per family in the 4 villages. Total number of households who cultivated rice in 2000 and 2001 calendar years is shown on Table 4.5.

Table 4.14. Rice farm households in the surveyed village in the Central Province

Code	Date Planted	Date Planted	No. of Households	Estimated area (Ha)	Production (Tonnes)
01	Amau	2001	60	1.060	0.871
02	Tutubu	2000	1	0.750	0.140
03	Idoido	2001	15	0.710	Yet to harvest
04	Yumuna	2001	10	Yet to plant	n.a
			86	2.52	1.011

Source: JIC Arice Farm Survey – April, 2002

n.a = not applicable

Based on the traditional system of rotation and bush fallow, the cropping system is not only mixed, but is complex and variable. The three (3) villages, namely, Amau, Tutubu and Idoido cultivated an estimated 2.52 hectares which yielded 1 tonne equivalent rainfed rice.

4.1.9.2 Agricultural Inputs

The traditional subsistence agricultural practices in the rural PNG, involve zero agricultural inputs such as fertilizers, chemicals and insecticides. This is common throughout PNG except in plantation mode of production and cash cropping.

4.1.9.3 Seed Supply

It has been reported that rice was introduced to the province by early settlers and missionaries. Seed supply had been through various sources, including farmer to farmer. Currently the main suppliers of seeds in the country are National and Provincial Departments of Agriculture, OISCA and ROC which are usually free of charge. The seeds distributed are not certified or registered.

4.1.9.4 Post-Harvest Processing and Loss

In respect to Post-Harvest Processing, it was revealed that manual methods are used in harvesting, threshing, drying, transport, sorting and milling. Significantly low responses were received on the questions in relation to loss during harvesting, post-harvest i.e. threshing, drying or storage. There are no rice mills in the surveyed villages during the interviews.

4.2 Rice Production in Morobe Province

4.2.1 History of Rice Growing in Morobe Province

According to popular belief, rice growing was introduced to Morobe Province in the Finschhafen District of Morobe Province, during the early 1900s. Rice growing as a food crop was taught to local people by German missionaries, plantation owners and by field officers of the German administration. It then spread to other districts in the province. This belief could not be substantiated as there was no record in print, other than an old rusty rice mill near a newly constructed LLG station in Wareo which is more than an hour's drive from the Finschhafen wharf. Villagers claimed that the rice mill was put up by the German administration before World War 2.

Discussions with local agriculture extension officers showed that growing of rice as a food crop had spread from rural areas like Finschhafen, Bulolo and Garaina to the Markham Valley in the southwest and into the Situm and Morobe areas in the northeast. Recently rice growing has spread to the outskirts of Lae City particularly in Kamkamong village and into the 3 to 5 mile areas where permitted settlers have occupied customary and government land respectively. Rice growing in Markham Valley started in the Lutheran Farmer Training Centre in Gabmazung in late 1970s as a food crop for the trainees in that centre. In early 1980s, rice growing was introduced as one of several food crops grown in a demonstration garden in Wau under a PNG government-sponsored program called Subsistence Agriculture Improvement Project (SAIP).

In Bubia Agricultural Research Station, rice was initially grown in the early 1970s as part of the Grain Research Program of the colonial Department of Agriculture, Stock and Fisheries (DASF). At that time, DASF had a unified structure with all provincial branches throughout PNG. After Independence in 1975, the DASF was divided into the Department of Agriculture and Livestock and the Department of Fisheries at the national level. At the provincial level, the DASF remained unified up until mid-1980s when Provincial Administrations became Provincial Departments with Divisions for various economic sectors. Most coastal Provinces chose to separate the Division of Agriculture and Livestock from the Division of Fisheries but one or two coastal Provinces chose to keep the two together.

In Morobe Province, the function of the former DASF was confined to rice trials inside the Bubia Agricultural Research Station. It took nearly two decades for the national DASF or DAL to move from rice research work in stations and training institutions to extension work in rice-producing districts in Morobe Province. In 1995, all functions related to agricultural extension were delegated to provincial and district administration under the Provincial and Local Level Government Reforms. It was during this period that the national DAL and the decentralized provincial DAL became full partners in rice development projects in Markham Valley that were funded by aid donors and by various government agencies.

The following are various rice projects initiated by government agencies, institutions and aid agencies in Morobe Province.

4.2.2 Rice Projects by ROC, FAO, Trukai Industries, NDAL & PDAL and NARI

4.2.2.1 Republic of China (On Taiwan)

In early 1990s, the ROC (On Taiwan) Agricultural Technical Team arrived in Bubia DAL Agricultural Research Station outside Lae following the signing of MOA between the respective Ministers for Agriculture and Livestock. A rice demonstration farm was set up in the station along the line of semi-commercial and subsistence farming system. Farming households were taught to grow rice under upland and irrigated lowland conditions and vegetables for food and cash. The demonstration farm program was followed by village extension program on rice and vegetable growing in the Huon District along the Markham highway within a radius of 50 kilometers from Bubia station.

During the initial rice cropping, interested landowners were assisted with a tractor and power tillers (small two-wheel cultivators) for land preparation and rice milling services. This encouraged the landowners to plant upland rice together with vegetables. Under the ROC farm

extension program, rice planting was done manually by members of the farm households by dribbling seeds in small furrows in the cultivated field.

Rice promotion by ROC team in Morobe Province reached its peak in 1999 when a landowner and 100 families of Poahum planted 52 hectares of customary land to upland rice with technical advice and assistance in farm machinery for ground cultivation. Only half of the crop on staggered plantings was milled, packed and marketed by a local businessman who became a partner with the landowner in the largest rice production scheme ever attempted in Morobe Province. For one reason or another, the landowner and the rice growers pulled out of the partnership. Some of the harvest fell into the ground. Growing plants were neglected and overran by weeds and tall grass. Later, individual families harvested whatever was left.

The ROC team extended the agriculture extension services to the Kaiapit District in mid-1990s, with a ROC staff being moved into a DAL house at the Kaiapit District Station in Mutzing. Rice and vegetables demonstration gardens started within the ROC sub-station as well as in food gardens of interested farmers. In the mid-1990s, nine members of the ROC team were operating in the Bubia station for Morobe Province alone. Three more were based in Laloki Agricultural Research Station outside of Port Moresby for rice and vegetable extension work in Central Province. In late 1990s, the ROC staff was reduced to five in Bubia and to two in Laloki respectively for political reasons.

Late in 2001, ROC closed down their field stations in Laloki and Mutzing and moved all staff and field facilities to Bubia. The total number of staff in Bubia was reduced further to five in that year. All extension services by the ROC team in Markham Valley and in the Poahum area are now based in Bubia station.

4.2.2.2 Phase 1 of Special Project on Food Security by FAO

In 1996, the 1st Phase of the Special Project on Food Security Program (SPFS) was implemented in Huon and Kaiapit Districts. The project was funded by FAO for a duration of three years and ended in early 2000. This project was a collaboration between FAO & NGOs engaged in food production activities in Markham Valley. The former Food Management Division (now Food Security Branch) provided the project management and coordination whilst project implementation was by the PDAL and DDAL staff in collaboration with ROC, Unitech and Trukai Industries.

Upland rice growing was part of the training program for farmer and extension staff and the extension program of Phase 1 food production that included cash crops, small livestock including inland fish and poultry production for food and cash of participating rural farm households. The Phase 2 called the South-South Cooperation on Integrated Food Production Project continues to remain unimplemented up to now because of lack of counterpart funding and institutional facilities from the proposed recipient Provinces - Morobe, Central and Milne Bay. The components of the Phase 1 of SPFS are:

- Rice-based farming system project
- Constraints analysis of the livestock industry in Markham Valley
- Integrated livestock production project
- Survey of water resources
- Small irrigation systems for vegetable and grain production including rice
- Inland fish growing

4.2.2.3 Trukai Industries Limited

Promotion of rice growing in Morobe Province by Trukai Industries started in the provincial capital, Lae. In 1995, Trukai Industries moved its demonstration farm on rice-based farming system from Cocoalands CRADP Subdivision in Cape Rodney of Central Province to the Bugandi and Bumayong High Schools in Lae. Demonstration plots on irrigated lowland and upland rice cultivation were established in these high schools in the hope that school leavers would be encouraged to grow rice and other food crops in their home communities after leaving school. From 1995 to 1998, Trukai Industries provided rice consultants from IRRI and Australia who visited rice sites in PNG and gave technical advice to agriculture extension staff and rice growers. In the same period, short overseas training courses on rice cultivation were made available to rice extension staff from national and provincial DAL.

All of the above activities were carried out by Trukai Industries under a MOA with the Independent State of PNG and the Three-Year Joint DAL-IRRI Rice Research and Development Project that was sponsored by Trukai Industries. The MOA between Trukai Industries and the State of PNG was signed in 1994 and extended in 1999. In the same year, Trukai Industries opened a 10-hectare demonstration farm on irrigated rice-based farming systems in Cleanwater in Kaiapit District followed by the commissioning of the Trukai Rice Receival and Milling Depot opposite the national DAL Station in Erap. Unitech has assisted by carrying out rice variety screening trials at the Cleanwater rice farm.

4.2.2.4 NDAL and PDAL

Promotion work on rice production activities by smallholder growers in Markham Valley started in the early 1990s by NDAL and PDAL but on a very limited scale. Peanut and maize production was the main economic activity that was being pushed ahead by both agencies under the former PIP Grain and Rice Project of NDAL. Regular annual rice programs by NDAL, PDAL and DDAL started only in 1996 when the Phase 1 of SPFS by FAO was implemented in Markham Valley. In 1999, when the NDAL staff and its development budget were reduced in half and all agricultural PIPs were handed over to government statutory bodies, the 10-year Rice Self-Sufficiency Program for PNG was launched by Food Security Branch of national DAL. It was given a one-off allocation of K3.2 million kina in 1999. Promotion of rice production in Morobe by NDAL and PDAL was given a boost for a year only.

In 2000 the national government through the National Executive Council employed a drastic cost-cutting measure and rationalization of departmental functions resulting in the withdrawal of funds. In the same year, the research activity and funding including the Bubia Research Station were handed over to NARI. The newly-started 10-year Rice Self-Sufficiency Program was shelved and rice promotion became only a part of a new PIP called PNG National Food Security Policy Programme with proportionately a much smaller budget of K2.8 million. Rice development program was relegated into being one of the 14 sub-programmes of the PNG NFSP. At present, upland rice production in Morobe Province by subsistence farmers is promoted directly by the Provincial and District DAL with assistance from national DAL, JICA, ROC, NARI and Unitech.

While the structure, functions, and funding of national DAL and the strengthening of the new roles of provincial and district DAL offices in Morobe Province were underway in 2000, the issue of peri-urban food security in urban centres such as Lae and Port Moresby emerged. When the member countries of FAO during the World Food Summit in Rome in 1999 addressed the issue of national food security, locally in Lae City, rice growing as a food crop intensified in the outskirts of Lae City in 3-mile up to 5-mile and in Kamkamong. This was the result of initiatives taken by the Provincial DAL office, NARI and ROC and a response by local farm-households to the rising costs of imported rice and other food items in urban supermarkets and community tradestores. Presently in the Morobe Province, all rice promotion activities are carried out by provincial and district agriculture extension officers and by technical officers from NDAL, JICA, ROC and NARI. The Food Security Branch of national DAL provides the coordination, facilitation and management of project resources from PNG government or donor agencies.

4.2.2.5 National Agricultural Research Institute (NARI)

The corporate and research centres of NARI are located in Morobe Province, the former in Lae City and the latter in Bubia Agricultural Research Station. NARI is a government statutory institution that was created by an Act of Parliament, *the NARI Act of 1998*. It is the national authority that conducts if not, coordinates, oversees, monitors and to some extent regulates all agricultural research activities in the country. At present, all aspects of rice research in the country are looked after by NARI. Regional variety screening trials, agronomic trials, monitoring of pests and diseases, and the formal release of suitable varieties to different ecological zones in PNG are among the functions of NARI as far as rice promotion is concerned.

In Morobe Province, NARI has accomplished most of the functions mentioned above since 1999 when all research activities, records, germplasm materials, facilities and budget on grain and rice were handed over by NDAL. It has moved a step further in applied research work by conducting yield trials of several promising medium and short-grain varieties in the 3-5 Mile settlement upland rice gardens. NARI is working closely with Unitech in the area of entomology particularly in monitoring and cataloguing pests and diseases of rice in PNG. It collaborates with NDAL, PDAL, DDAL and NGOs in carrying out its research program on rice and other grains across the country.

4.2.3 Location of JICA Rice Farm Survey

Table 4.15 below shows the two districts and villages that were selected for the survey on the recommendation by the Provincial DAL Advisor for Morobe Province.

Districts	Villages
1. Finschaffen	Wareo Salodi
2. Lae	Poahum 3 - 5 Mile

Source: JICA Rice Survey, May 2002

4.2.4 Criteria for Selecting the Two Districts for the Rice Farm Survey

4.2.4.1 Finschafen District

- i. The Provincial DAL Advisor believes that selection of this district for the Rice Study will produce a better impact than other districts. Other districts in the province have been studied and have had projects in the past but rice production stopped when farm production inputs from government or donor agencies were withdrawn for one reason or another. This has not happened in Finschafen. With or without assistance from government or donor agencies, local farmers continue to grow rice for food. They de-husk dry paddy rice with mortar and pestle or by beating it inside a tied up bag that is cut from the lower part of a pair of jeans. Locals called it the "jean method" of husking rice.
- ii. The Provincial DAL Advisor believes that the promotion of rice as a subsistence food crop would have a wider application and success in Finschafen District because of its relative isolation from Lae City and its proven ability to be self-sufficient as a remote outpost. The district has its own traditional upland rice varieties, the Finsch White and the Finsch Red. Rice growing became part of the local subsistence gardens long before other districts in the province started growing rice.



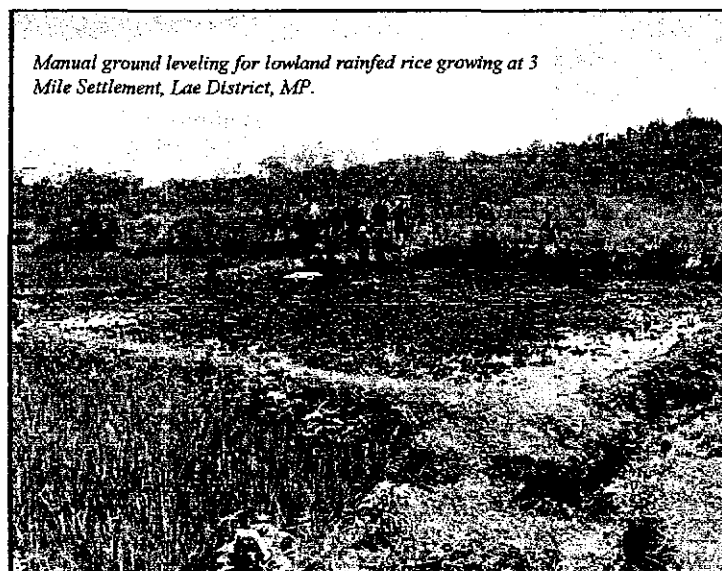
Staff houses at the background of cooking facilities used by the ACS Team at Wareo LLG Centre, Finschhafen District during the surveys of Wareo and Salodi village in that District.

4.2.4.2 Lae District

- i. Starting from 3-mile to 7-mile area, west of Lae City along the Okuk Highway is a thriving peri-urban community of legally permitted settlers who live in housing blocks on government land. Below these housing blocks are large areas of waterlogged land that have no commercial or industrial use. Hundreds of settler households have reclaimed these abandoned swampy areas and have developed them into rainfed lowland rice paddy fields without financial assistance from the Lae City Council, District DPI, national DAL, donor agencies or NGOs. They have cleared, leveled, bunded, cultivated and constructed the crude irrigation and drainage systems using handtools ie axes,

forks, spades and water for determining slope gradients and vertical levels of the paddy fields.

- ii. Some areas in 3-mile have so far planted and harvested rice for more than two years. In 4-mile and 5-mile, settler households are building new paddy fields each year at their own initiative and expense simply because others have grown and eaten their own rice and have sold surplus to neighbours. Although soil in the upper areas have shallow soil deposits, the constant supply of run-off water that flows from the hills on the other side of the highway has enabled this area to produce two crops of rice each year. This show of community initiative on rice production in abandoned government land with no urban use has made this particular area a good choice for the JICA Rice Study.
- iii. The Lae District DAL office is located in 3 Mile just opposite the national DAL In-Service Training Centre. This location makes it ideal for development into a rice resource and extension centre for a Peri-Urban Food Security Program that has become essential and timely for addressing the food security requirements of the rapidly expanding population in all outskirts of Lae City. Because of the nearby lowland rice fields, the run-down District DAL office can be converted into a resource centre for extension services and training of peri-urban rice growers on cooperative land reclamation, irrigated rice cultivation, paddy rice storage, drying, milling and marketing of rice. Trainees in this centre can be accommodated at the nearby DAL In-Service Training Centre. However, certified seed multiplication and storage can be carried out in Wawin Station in Markham Valley.



- iv. The Situm area of Lae District has large areas of fertile soil with even distribution of rainfall throughout the year. In year 2000, 52 hectares were cultivated and planted by the local landowners with upland rice in Poahum village. Rice was milled, packed and sold in Lae as "Our Rice". Production stopped because of problems between the landowner and the milling and marketing contractor. In

2001 and 2002, more than twenty households in Poahum planted rice again in small family-size plots as a food and cash crop with all costs of production being shouldered by the farm households themselves. This record of self-reliance in subsistence rice production has added to the decision by the Provincial DAL Advisor to recommend Lae District for this study.

4.2.5. Summary of Results of Rice Farm Survey in Two Selected Districts

4.2.5.1 Rice Eco-system and Cropping Patterns

Rice is grown mostly as an upland mono-crop in the two surveyed districts and in the Morobe Province. The upland rice gardens in Poahum and Kamkamong are located in moderately flat areas of black fertile soil in the plains below the Mt Rowlinson Ranges. In contrast, the upland rice gardens in Finschhafen District are scattered in hillsides or small terraces where the rugged topography of Wareo, Salodi and Sosoningko dictates walking distances of one to five kilometers between small rice garden plots or family blocks.

In Lae District particularly from 3 Mile to 5 Mile, rice is grown as a rainfed lowland crop due to the swampy conditions. Settlers who were given housing lots in subdivided government land along the Markham highway have occupied the lower adjoining waterlogged sago areas and converted this area manually to rain-fed lowland paddy fields. These are the only sizable rain-fed lowland rice fields in PNG that have been built by the local people themselves with the use of common gardening tools such axes, bushknives, digging forks and spades and water for determining ground levels. The rice eco-systems and cropping patterns in surveyed villages in two districts are shown in the table below.

Table 4.16. Rice Eco-systems and Cropping Patterns in surveyed villages

District	Villages	Eco-system	Next & final crop	Soil rejuvenation
1. Finschhafen/ Kotte LLG	1. Wareo	Upland monocrop	Sweet potato	Bush fallow
	2. Saludi	Upland monocrop	Sweet potato	Bush fallow
2. Lae/Lae Urban LLG	3. Poahum	Upland monocrop	Sweet potato	Kunai fallow
	4. 3-5 mile	Rainfed lowland monocrop	Ratoon/new rice crop	Grass fallow

Source: JICA Rice Farm Survey, May 2002

4.2.5.2 Production Technology of Rice

All other practices in rice cultivation in the surveyed districts are typical of upland rice in PNG as shown in the Table 3 below. Two practices are notable; first is the type of seeds planted in the two surveyed districts and second is the method of planting used in Poahum where rice is grown under upland conditions.

In Lae District, farmers use seeds of Taichung Sen 10 (TCS-10) that are saved from previous crops. In Finschhafen District, they use the seeds of two local varieties more often than the imported TCS-10 seeds. Finschhafen growers also save planting materials from the previous crops like all growers of rice in PNG. These two local varieties are called Finsch White and Finsch Red. The latter is not as red as the red Mekeo rice. It has a brown hull. The other has a white hull. Both are of medium and bigger grains than TCS-10.

The TCS-10 rice plants grown from previous crops over the last ten years are now showing uneven vegetative growth, many off-types and uneven maturity. At the least, culms also exhibit three distinct types of colour, dark green and light green and dark red. The original foundation seed for TCS-10 was imported to PNG from Taiwan in the early 1990s by the ROC Technical Agricultural Team.

In Poahum, growers transplant rice seedlings of TCS-10 after a rainfall in wet cultivated soil. Three seedlings are planted in each hill. The soil is black, loamy and fertile with even distribution of rainfall throughout the year. Refer to rainfall data for Lae District, Section 9.2. Transplanted seedlings recover and settle down quickly. Average yield is placed at 3.25 tonnes/hectare. Explanation given by growers in Poahum who transplant rice seedlings in upland condition is that the yield is higher from transplanted seedlings. They say that most of dibbled or drilled seeds are either too much or too little and some do not germinate because of deep planting resulting in uneven crop stand and lower yield. They say that germinating seeds in open seedbed in the same field and transplanting them at the right time would always produce a uniform crop and better yield. Moreover, the even rainfall distribution in the area allows for two crops per year for hardworking farmers.



Transplanting of seedlings in upland plots in Las Kina village in Poahum, Lae District. Note: Rice plot in foreground has plenty of missing seedlings, result of direct seeding by dibbling method using poor seed with low germination.

Table 4.17. Methods of Land Preparation, Planting, Weeding; and Type of Seeds, Fertilizers and Insecticides Used

Villages	Method of Land Preparation	Method of Planting	Method of Weeding	Type of Seeds Used	Insecticide Spraying	Use of Fertilizers
Wareo	Slash & burn	Drilling	Hand	Uncertified	Nil	Nil
Salodi	Slash & burn	Drilling	Hand	Uncertified	Nil	Nil
Poahum	Tractor	Transplant	Hand	Uncertified	Nil	Nil
3-5 mile	Manual tools	Transplant	Hand	Uncertified	Nil	Nil

Source: JICA Rice Farm Survey-May, 2002



4.2.5.3 Cultivated Area and Yields of Farm Households in Surveyed Villages

Poahum has the best soil for upland rice growing in terms of soil texture and nutrient content and rainfall distribution. It is no wonder that the average yield for upland rice in Poahum is 3.25 tonnes/hectare. Although the food gardens in Wareo undergo longer fallow periods with secondary forest re-growth, Wareo still has the lowest production probably because of the steep slope of food gardens that have to be located in terraces or mountain sides and because sunlight is blocked by steep mountain ridges and thick cloud cover in the morning.

The farm survey team inspected a rice garden in Wareo with several varieties that were ready for harvesting. IR10, a dwarf early maturing, long-grain variety obtained from OISCA grew 1.5 feet only with empty panicles. TCS-10 grew to only two feet when it is supposed to be of medium-height. Only the two tall upland varieties of Finsch White or Red grew well and produced good panicles.

In Salodi, the TCS-10 crop in a 1-ha community rice block is emerging well at tillering and seedling stage. Seven families share two plots of 15m x 24m each. This garden is in a gently rolling terrace with better sunlight exposure. The ground was cultivated with a mouldboard plough pulled by a water buffalo that is trained and handled by a local man with the local Lutheran Mission station. Access to this communal rice garden is by foot, a kilometer away from the main road. By road, the garden is ten kilometers away from Salodi village.



Land preparation with water buffalo & mouldboard plough at Hatyo in Salodt village in Finschhafen District, sponsored by Lutheran Mission.

In 3 to 5-Mile Settlement outside Lae, the rice plots are contiguous and neatly constructed with a number of wide irrigation canals which distribute run-off water in creeks from the mountain on the other side of the Markham Highway. Settlers built these rain-fed lowland paddy fields and irrigation system themselves possibly with skills earlier learnt at the first irrigated lowland farm in Morobe that was built by a Filipino teacher at the Gabmazung Farmer Training Centre in the 1970s-80s. Some parts of the swampy area in 3-5 Mile have patches of sago palm which usually give way to rice cultivation after sago extraction by the settlers. The whole swampy area drains into the Markham River below.

A young man from 4-mile attended the OISCA Rice Course last year. Upon his return, he teamed up with two older farmer leaders in encouraging unemployed young men in clearing and expanding the rice paddy fields. Only a few hand tools such axes, spades and timber with the aid of water on the ground were shared between settlers to construct main irrigation canals and to locate, level and bund (earth wall) the paddy fields. Whatever little knowledge on irrigated lowland rice cultivation that he had learnt at the OISCA Training School in Warongoi, ENB was put to good use by this young leader in 4-Mile.

But training courses, certified seeds, basic hand tools and technical advise are badly needed by settler households in the production and post-harvest technology of rain-fed lowland rice production. Farmers here have problems in soil and water control and management. They do not use organic or inorganic fertilizers, insect pests control or management measures. TCS-10 seeds have deteriorated after more than 20 generations of planting from the original foundation seeds. They lack basic hand tools like axes, spades, digging forks, bushknives and sickles. All these have resulted in low yields of 2.5 tonnes/ha. Below is a chart for the average area and yield in four surveyed villages in Morobe Province.

Table 4.18. Average Cultivated Area and Yield and Number of Rice Growers

Villages	Ave. Area Planted (Ha)	Ave. Yield/ Ha (Tonne)	No. of Rice Growers
Wareo	0.09	2.25	12
Salodi	0.04	2.50	15
3. Poahum	0.08	3.25	27
4. 3-5 Mile	0.15	2.50	36

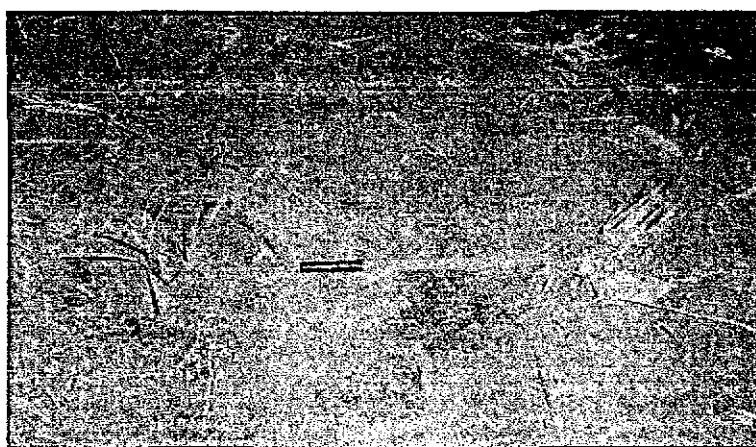
Source: Rice Farm Survey-May, 2002

4.2.5.4 Agronomic Problems Observed in Farm Survey

Leafrollers (*Cnaphalocrocis medinalis*) are the common insects attacking maturing rice plants in all the surveyed villages. The degree of damage is uneconomical so as to cause undue alarm. Caseworms (*Nymphula depunctalis*) in 3-5 Mile lowland ricefields managed to destroy several plots of newly transplanted seedlings when the owners failed to notify the PDAL extension officers for insecticide spraying because of the election campaign.

False Smut (*Ustilaginoidea virens*) is the common disease observed in the two villages surveyed in Finschhafen District. It could be attributed to the continuous cloud cover and wet weather in the surveyed area that had precipitated damp conditions for the spores of False Smut to multiply rapidly in poorly ventilated rice gardens. Growers there were advised to obtain rice seeds from gardens not affected by False Smut spore balls. Leaf Spot was also seen in several ratoon plots of TCS-10 in 3-Mile.

Seedlings and growing rice plants are stunted in some places in the upper wet paddy plots, because of thin topsoil and slightly alkaline condition of water supply at pH 7.5. Advice given by the visiting survey team was to incorporate organic matter and to apply chicken manure and ammonium sulphate fertilizers in the soil in the seedbed and in the wet paddy plots before transplanting the rice seedlings. There is a need to bring in an irrigation engineer to study and re-design the irrigation and drainage system in 3-5 Mile.



Poor seedlings at left (of ballpen on ground) and healthy seedlings at right. Depth of planting was too deep in a communal rice garden in Salodi village in Finschhafen



Poor germination due to deep planting by dibbling method. Distance between plant or hills is also too wide for upland rice in Salodi village in Finschhafen District, Morobe Province

Table 4.19. Rice Pests, Diseases and Problems of Plant Nutrition, Soil & Water Management

Villages	Insect Pests	Diseases	Plant Nutrition	Soil Conditions	Water Management
1. Wareo 2. Salodi	- Leaffolder - Leaffolder	- False Smut - False Smut	- Nil - Nil	- Slope + cloud cover - Slight cloud cover	- Nil - Nil
3. Poahum 4.3-5 Mile	- Leaffolder - Leaffolder & caseworm	- Nil - Brown Spot	- Nil -NPK& Trace Elements	- Nil - Water Alkalinity & thin topsoil in uphill plots.	- Nil - Faulty Irrigation & Drainage System

Source: JICA Farm Survey-May 2002

4.2.5.5 Current Support System for Rice Promotion in Surveyed Villages

Table 4.20 Current Types and Sources of Support at National, Provincial and Districts Levels

Villages Surveyed	Areas of Rice Promotion	National	Provincial	District/LLG
1. Wareo, Finschafen District	1. Prod. tools/materials/machinery	Nil	Nil	Nil
	2. Post Harv. tools/machinery	2 sickles from OISCA	1 rice micro-mill	Nil
	3. Farmer Advisory Visits	Nil	Nil	Ext. Officer/ Wareo
	4. Staff/Farmer Leader Training	OISCA Rice Course	Nil	Nil
	5. Rice Resource Centre	Nil	Nil	Nil
	6. Supply of Certified Seeds	(Refer to next topic)	Nil	Nil
	7. Ext. Staff House on Site	Nil	1 of 3 houses- Kotte LLG Res. Centre	
	8. Ext. Staff Vehicle/Funds	Nil	Vehicle shared w/ Kotte LLG AO.	
	9. Applied Research on Site	NARI Variety trials	Nil	Informal variety trial.
	10. Agricultural Credit Facility	Nil	Nil	Nil
	11. Farmers Assoc/Cooperative	Nil	Nil	Nil
2. Salodi, Finschafen District	1. Prod. tools/materials/machinery	Nil	Nil	Nil
	2. Post Harv. tools/machinery	1 rice mill ex NDAL	Nil	Nil
	3. Farmer Advisory Visits	Nil	Nil	Ext. Officer/ Wareo.
	4. Staff/Farmer Leader Training	Nil	Nil	Nil
	5. Rice Resource Centre	Nil	Nil	Nil
	6. Supply of Certified Seeds	(Refer to next topic)	Nil	Nil
	7. Ext. Staff House on Site	Nil	Served from Kotte LLG Resource Centre.	
	8. Ext. Staff Vehicle/Funds	Nil	1 shared w/ Kotte LLG admin. Officer	
	9. Applied Research on Site	Served by Wareo	Nil	Nil
	10. Agricultural Credit Facility	Nil	Nil	Nil
	11. Farmers Assoc/Cooperative	Nil	Nil	Nil
3. Poahum, Lae District	1. Prod. tools/materials/machinery	Hand tractor ex ROC	Nil	Nil
	2. Post Harvest tools/machinery	3 sickles ex ROC	Nil	Nil
	3. Farmer Advisory Visits	ROC, NARI, NDAL	PDAL EO	DDAL EO.
	4. Staff/Farmer Leader Training	Nil	Nil	Nil
	5. Rice Resource Centre	Nil	Nil	Nil
	6. Supply of Certified Seeds	(Refer to next topic)	Nil	Nil
	7. Ext. Staff House on Site	Nil	1 on site ex Prov / Dis/ Admin	
	8. Ext. Staff Vehicle/Funds	NDAL=1 x L/Cruiser	shared with other DDAL staff.	
	9. Applied Research	Nil	Nil	Nil
	10. Agricultural Credit Facility	Nil	Nil	Nil
	11. Farmers Assoc/Cooperative	Nil	Nil	Nil
4. 3-5 Mile, Lae District	1. Prod. tools/materials/machinery	Nil	Nil	Nil
	2. Post Harvest Technology	2 sickles ex OISCA	Nil	Nil
	3. Farmer Advisory Visits	ROC, NARI, NDAL	PDAL EO	DDAL EO
	4. Staff/Farmer Leader Training	OISCA Rice Course	Nil	Nil
	5. Rice Resource Centre	Nil	Nil	Nil
	6. Supply of Certified Seeds	(Refer to next topic)	Nil	Nil
	7. Ext. Staff House on Site	Nil	1 DRDO + 1 for Prov. Food Crops Officer	
	8. Ext. Staff Vehicle/Funds	Nil	1 shared with other DDAL staff.	
	9. Applied Research on Site	NARI variety trials	Nil	Nil
	10. Agricultural Credit Facility	Nil	Nil	Nil
	11. Farmers Assoc/Cooperative	Nil	Nil	Nil

Source: JICA Rice Farm Survey- May 2002

4.2.5.6 Certified Seed Multiplication and Distribution

After almost ten years, certified seeds of TCS-10 will be available this year to replace the old TCS-10 throughout PNG that are now showing obvious signs of possible genetic degeneration and mechanical mixing with other varieties. Foundation seeds of the variety TCS-10 were imported from Taiwan by JICA PNG and are now being multiplied in the irrigated rice paddy

fields in OISCA Training Centre in Warongoi, ENB. These seeds will be available sometime in the 3rd quarter of this year to PDAL for distribution to rice-producing districts in PNG.



5 Mile -Lae District MP- Simple Rice Threshing method – A stand made of bush materials and a piece of arc mesh.

Importation of foundation seed and multiplying them in Warongoi, ENB are ad hoc measures taken by JICA. Details on which government agencies or institutions in PNG in the long term should import and multiply certified seeds of suitable varieties in PNG are discussed in Part II Master Plan, Priority Projects. The current situation on certified seed importation, multiplication and distribution of TCS-10 is shown in Table 4.21 below.

Table 4.21. Importation, Multiplication and Distribution of Certified Seeds, TCS-10

Tasks Involved	Current Situation		
	National	Provincial	District/LLG
1. Importation of Foundation Seed	JICA	Nil	Nil
2. Multiplication of Foundation Seed	OISCA, ENB	Nil	Nil
3. Storage Facilities for Certified Seed	Nil	Nil	Nil
4. Distribution of C/S to Rice Farmers	FSB-DAL	PDAL	DDAL

Source: JICA Rice Farm Survey-May 2002

4.2.5.7 Post-Harvest Technology

All harvesting and practices in post-harvest are manually done except in areas where rice mills are available. Harvesting of rice is done by cutting the mature panicles or stalks with a small knife or with the forefinger and thumb. The cut panicles or stalks are dried on small tarpaulins or bracts of black palm. Then, the grains are stripped by hand or separated by beating on a threshing wood or wire screen. The team observed that there are less than six factory-made sickles that are shared among rice growers in each of the surveyed villages. Winnowing is done during windy days. It is done by dropping or throwing the dry grain slowly in the air so that the

wind can blow the rubbish away. Only the ROC station in Bubia has a portable hand-operated winnower and a portable motor-driven thresher that are moved around in Lae and Huon Districts.

There are no middlemen in the villages or districts who deal in paddy purchasing, drying, milling, storage, packaging and marketing in Morobe Province. The Rice Receiving Depot of Trukai Industries in Erap station in Kaiapit is an extension of the current milling and marketing facilities of Trukai Industries that was set up to provide an outlet for wet or dry paddy of local growers. In all the rice-growing districts of Morobe, milling services are provided by government and aid donor rice mills at 15 to 20t/kg of milled rice.

In remote villages, rice transportation from the villages to the rice mills is as difficult as it is in Finschhafen. Subsistence farm households have to fall back to the old reliable mortar and pestle or the recent *jean* method of dehulling rice. Dry paddy or milled rice in peri-urban and rural villages is stored in houses in old flour bags or imported rice bags.

The following table shows the practices in post-harvest technology of rice in the two surveyed districts.

Table 4.22. Current Practices in Post-Harvest Technology

Villages	Harvesting	Threshing/ Winnowing	Paddy Drying	Common Farm Household Practice	Rice mill Location	Grain Storage
1. Wareo	Knife	Manual	Sun	Mortar & pestle/Jean	Wareo	House
2. Salodi	Knife	Manual	Sun	Mortar & pestle/Jean	Wareo	House
3. Poahum	Knife	Manual	Sun	Mortar & pestle	Bubia	House
4. 3-5 Mile	Knife	Manual	Sun	Mortar & pestle	Bubia	House

Source: JICA Rice Farm Survey-May 2002

4.2.5.8 Farm Machinery & Facilities for Post Harvest Technology in Surveyed and Unsurveyed Locations in Morobe Province

Data supplied in this section is based on the Farm Survey and on available information from sources in Food Security Branch Office in NDAL Erap Station. Included in the table below are working and serviceable machinery and pneumatic equipment for harvesting, threshing, winnowing, drying, milling and manual and automated packaging machinery in the Morobe Province including Lae City.

The number of working rice mills for rice promotion in the province are of essential interest in this report. There are a total of nine accounted rice mills in the Morobe Province with three located in Kaiapit District, two in Finschhafen District, two in Bubia ROC station for Huon District, one with the PDAL Office in Lae (recently received from JICA), and one in the remote station of Morobe.

In the JICA rice survey of five selected Provinces, Morobe Province has the highest total number of working rice mills in PNG. Given the limited time for the JICA Rice Survey, this number does not include rice mills that may have been purchased and distributed by private concerns or donors during the preparation of this report. There are no storage sheds for paddy and milled rice in Morobe Province except for the Trukai Rice Terminal in Lae. Similarly, there are no packaging facilities for milled rice in the rice growing villages. The Poahum

landowner and rice growers had to rely on a businessman in Lae for arrangements with packaging and marketing of their rice brand called "Our Rice."

Table 4.23. Current Number, Locations and Sources of Machinery and Facilities for Post Harvest Technology

Types	No.	Location	Agency	Rice Sites Served
1. C/Harvesters				
-4m cutterbar	1	Cleanwater	Trukai	Cleanwater
-header type	1	Bubia ROC Station	ROC	Bubia Station
2. Rice Reapers	1	Erap NDAL Station	NDAL	Erap
	1	Cleanwater	Trukai	Cleanwater
3. Threshers:				
-W/ motor	1	Cleanwater	Trukai	Cleanwater
	1	Erap NDAL Station	NDAL	Erap
	1	Bubia ROC Station	ROC	Lae/Huon Districts
-Pedal type	1	-do-	-do-	-do-
4. Winnowers, manual	1	Bubia ROC Station	ROC	Lae/Huon Districts
5. Grain Batch Dryers,	1	Erap Rice Receival Depot	Trukai	Kaiapit District
W/ Motor	1	Erap NDAL Station	NDAL	Erap Station
	1	Wawin PDAL Station	PDAL	(Needs repair)
6. Rice mills				
-Micro-mill, 75kg/hr	1	Wareo, Finschafen Dist.	PDAL	Wareo & Salodi, Finschafen
-200+ kg/hr capacity	1	Finschafen Dist. Station	NDAL	Recent & uninstalled.
	1	PDAL Office, Lae	JICA	Recent & uninstalled.
	2	NDAL Erap Station	NDAL	1 mobile+1 fixed-Kaiapit
	1	Bubia ROC Station	ROC	Lae & Huon Districts
	1	Erap Rice Receival Depot	Trukai	Kaiapit & Huon Districts
	1	Morobe Patrol Post	MP	Morobe Patrol Post
-350+ kg/hr capacity	1	Bubia ROC Station	ROC	Not used.
7. Packaging machine				
-Fully automated	1	Trukai Lae Terminal	Trukai	Company use only
-Manual	1	C/o Poahum rice growers	Private	"Our Rice" packaging, 2000
8. Storage Shed	1	Trukai Lae Terminal	Trukai	Company use only

Source: JICA Rice Farm Survey-May 2002 & Food Security Branch, NDAL

4.2.6 Direction of Progress in Rice Cultivation for Self-Sufficiency

Rice growing is being encouraged and supported throughout PNG as a food crop for peri-urban and rural farm households under the National Food Security Policy Program. At the end of the each harvest, it is hoped that households will have enough milled rice for their own consumption. The JICA funded farm survey in the Morobe Province confirms that some of the milled rice was sold to neighbouring households at prices well below that of the imported rice sold in supermarkets and village trade stores whenever the rice farm households needed cash.

Particularly in the two surveyed districts, production of rice in small manageable family-sized gardens, both for household consumption and for sale is increasing steadily since the year 2000. At present, all rice farming households continue to purchase some imported rice at least once a week if not once a fortnight. This is an indication that households have not yet fully attained self-sufficiency in rice production. The constraints to rice production are addressed in the Master Plan.

The survey revealed that there are willing growers and available good land that has the potential to produce more rice and increase current yield. In order for that to be realized, the growers need to have access to certified seeds, fertilizers, farm chemicals, basic hand tools for land preparation, harvesting and post-harvest work. Basic skills-oriented training in upland or lowland rice production is also necessary. Furthermore, rice production can be increased if small, user-friendly and appropriately built rice mills were brought closer to farmers' farms or gardens.

In summary, table 4.24 below lists the conditions that were found through the farm survey with regard to the direction of progress of rice cultivation in the surveyed villages.

Table 4.24. Comparison of current rice households with potential rice households, area planted and potential rice area, and average yield against potential yield

Surveyed Villages	No. of Rice Household	Non-rice Farm H/holds	Total Area Planted (ha)	Potential rice area (ha)	Average Yield/ha (tonne)	Potential Yield/ha (tonne)
Wareo	12	15	2.28	20	2.25	3.00
Salodi	15	25	0.60	30	2.50	3.00
3. Poahum	27	80	2.16	100	3.25	4.00
4. 3-5 Mile	36	32	5.40	20	2.50	3.00

Source: Rice Farm Survey- May 2002

It should be noted that data on the size of arable land from the PNGRIS database are limited only to districts and not specific to villages within each district. It was therefore necessary to conclude on the availability of arable land for rice growing on the visual and close inspection of the surveyed villages. The number of available farm households who are not yet engaged in rice production is based on the 2000 National Census. The current yield/hectare for rice is discussed in the preceding section 4.2.5.3, Cultivated Area and Yields of Farm Households in Surveyed Villages.

Table 4.25 below shows the potential for increasing rice production in the Morobe Province by adopting the following:

- i. Increase the yield of each rice garden currently under rice cultivation.
- ii. Increase the area of each household currently cultivating rice.
- iii. Increase the number of rice farm households.

Table 4.25. Analysis of the proposed means to increase rice production

Surveyed Villages	Three Directions for Rice Promotion		
	1. Can current rice yields be increased?	2. Is there more arable land to increase farm size/household?	3. Are there farm households who can grow rice?
1. Wareo	- Yes -	- Yes & accessible	- Yes
2. Salodi	-do-	-do-	-do-
3. Poahum	- Yes -	- Yes & accessible	- Yes
4. 3-5 Mile	-do-	-do-	-do-

Source: Rice Farm Survey- May 2002

4.2.7 Constraints in Rice Promotion in Morobe Province

Table 4.26. Brief Analysis of Problems and Constraints

Areas	Problems and Constraints	Consequences	Causes
Production Technology	1. No farm capital 2. No certified seeds 3. Shortage of hand tools 4. Insect pests & diseases 5. Poor irrigation/drainage system	- Low production - Low yield - Small area cultivated - Nil or low yield - Water wastage	- No credit facility for rice crop - No foundation seed - No credit facilities - No sprayers & chemicals - No engineering know-how
Post Harvest Technology	1. No sickles, tarpaulins 2. No threshers & winnowers 3. Shortage of rice mills 4. No grain storage facilities	- Low production - -do- - -do- - -do-	- No credit facilities - -do- - -do- - -do-
Support Activities	1. No Nat'l Rice Resource Centre 2. No Prov. Rice Resource Centre 3. No full-time project vehicle 4. PIP NFSP is for five years only.	- Low production -do- - Slow rice promotion - Project fragmentation	- No government funding -do- -do- -Low priority for rice promotion

Source: JICA Rice Farm Survey- May 2002

4.2.8 Recommendations

Details of recommendations for problems and constraints are covered in Part II Master Plan - Annex of this report. Summary of recommendations is shown in Table 4.27 below.

Table 4.27. Summary - Problems and Constraints of Rice Promotion in Morobe and Recommendations.

Areas	Problems and Constraints	Suggested Solutions	Implementing Agencies	PROPOSED FUNDING SOURCES & ROLES		
				National & Donor Agencies	Provincial Government & Administration	District & LLG Administration
1. Production Technology	1. No farm capital 2. No certified seeds 3. No manures & fertilizers 4. Shortage of hand tools 5. Insect pests & diseases 6. Poor irrig./drainage system	<ul style="list-style-type: none"> Capital injection through credit & incentive facilities Encourage efficient distribution of Certified seeds & Hand tools Training on pest control / good drainage / soil improvement & rice growing Improve farmer networking through formation of Farmer Assoc & cooperatives Provide irrigation engineer.. 	NDAL PDAL DDAL NDP	RDB of PNG NARI 2KR fertilizers 2KR tools 2KR chemicals NDAL & JICA	Prov. Admin. Budget Prov. Resource Centre Remit payments to 2KR -do- -do- Oversee activity	Support Grant Distribution Collect payment Implement -do- -do-
2. Post Harvest	1. No sickles, tarpaulins 2. No threshers & winnowers 3. Shortage of rice mills 4. No grain storage facilities	<ul style="list-style-type: none"> Provide necessary implements as part of incentive package. Provide additional rice mills & train farmers on use of mills Assist farmers set up storage facilities with appropriate technology for purposes of sustainability. 	NDAL PDAL DDAL ND	2KR tools 2KR machinery 2KR/donors Aid donors	Remit payments to 2KR -do- -do- Supervise construction	Distribute/collect Distribute/collect Implement/collect Supervise use
3. Support Activities	1. No Nat'l Resource Centre 2. No Prov. Resource Centre 3. No full-time project vehicle 4. PIP NFSP is for five years.	<ul style="list-style-type: none"> Develop Res. Centers Increase institutional support Review NFSP with a view to extend. 	NDAL PDAL DDAL ND	Aid donors Aid donors NDAL or donors Create Authority	Security of resources. O & M costs Prov. Admin. Budget Collaborate	Collaborate Collaborate O & M Costs Collaborate

4.3 Rice Production in Madang Province

4.3.1 History of Rice Growing in Madang Province

There is no written account of the origin of rice growing in Madang Province. When the JICA Survey team visited Madang Province in May 2002, none of the extension officers in the province had a definitive answer to when or how rice growing was introduced into the province. Instead they said that in the past the German or Australian Administration never promoted rice growing in the province as a commercial food crop. Cocoa, coconut and coffee were the preferred plantation and smallholder cash crops encouraged by the German and Australian colonial administrations and by the PNG government after Independence in 1975. Rice may have been introduced into the Province as a food crop, particularly into plantations by the German administration and in mission stations by missionaries before World War 2.

Whatever is the origin, rice is now widely planted across the province as a food crop in subsistence food gardens by most rural farming households. Unlike in East Sepik, Morobe, and Central Province where the current promotion program for rice as a food crop had been preceded by extensive smallholder rice production projects by government agencies and donor agencies over a period of seventy years (1950s in ESP and 1930s in Central Province and 1990s in Morobe), *rice growing in Madang Province did not require a history of smallholder programs for rice to become a staple crop in this province.* The first Provincial Subsistence Rice Development Program for Madang was launched in 1999. *There are three major participants. A short discussion of the role and contribution of each participant is given below.*

4.3.2 Joint Rice Promotion Efforts by NDAL, PDAL/DDAL and JICA

4.3.2.1 NDAL

NDAL signed a MOU in late 1999 with the Provincial Administration of Madang on behalf of the PDAL and DDAL for rice promotion programme and other Food Security Policy sub-programmes (traditional staple crops, small livestock and inland fish growing) that are being implemented in the province. The MOU provided for a project vehicle from NDAL to PDAL for rice and food promotion work in Madang. NDAL is responsible for arranging training courses on rice and other food in PNG or overseas for extension officers and farmer leaders in the province. Food Security Branch of NDAL provides the monitoring, coordination and management of the rice program at the national level. In the MOU, PDAL and DDAL of Madang are responsible for implementing the provincial and district programs for rice production among the other sub-programs of NFSP.

4.3.2.2 PDAL and DDAL

The MOU provided for the PDAL to participate through monitoring, coordinating, managing and reporting on the rice promotion work in the province to NDAL headquarters. The program in the target villages within selected districts is supervised and implemented by DDAL staff. The survey team found out that implementation of the subsistence rice program in the selected districts of Madang and Usino-Bundi has been made easier by the fact that these districts have the most established district facilities and LLG administrative structures in the province. Usino-Bundi District has a new and self-contained District and LLG Administration Headquarters in Walium station where all government divisions have offices, accommodation and transport for public servants.

In the Momase Region, Madang Province has a Provincial Administrator, District Administrators and LLG Managers who have given equal priority and funding support to rice and other food promotion work such as Bismarck Barramundi Project in their respective areas. Support activities provided to rice promotion by the District Administrators and LLGs in the surveyed districts are listed in Chapter 4.3.5.5. The level of support given by the Provincial Administration, PDAL, DDAL & LLG has made the subsistence rice extension program a success in the province.

4.3.2.3 JICA

JICA's support for rice promotion in Madang Province started in 2001 when the JICA Smallholder Agriculture Advisor joined the Food Security Branch of NDAL. In 2001, a JOCV was posted to the province for the rice program. The Embassy of Japan provided five medium-size rice mills to the province to enable several rice-growing districts to mill their rice harvests. In the same year, a provincial extension officer attended a short rice course in Japan. In October 2001, an extension officer and four farmers attended the short course on rice production in OISCA Training Centre in Warongoi in ENB. In early 2002, two short-term JICA experts on farm machinery and rice production were sent to PNG. Both experts visited Madang Province and gave valuable advice to extension staff and rice growers. Recently, JICA donated a hand-tractor to PDAL for demonstration on faster cultivation of upland and lowland rice fields.

4.3.3 Location of JICA Rice Farm Survey

Based on recommendations from the Madang Provincial DAL Advisor, two districts and four respective villages were selected for the survey.

Table 4.28 Survey Districts & respective villages

Districts	Villages
1. Madang	1. Lagaha 2. Umun
2. Usino-Bundi	3. Danaro 4. Yakumbu

Source: JICA Rice Survey - May 2002

4.3.4 Criteria for Selecting the Two Districts for the Rice Farm Survey

The PDAL Advisor and his staff did the selection of the districts and villages for the survey. The PDAL Advisor was involved in the organisation of the survey. He ensured that all the PDAL and DDAL staff assigned to the survey had followed the schedules and arrangements for government transport, field accommodation, field visits to District staff, village elders, councilors and the interviews of selected rice farmers in each village. Two PDAL vehicles, five provincial staff and one JOCV officer accompanied the survey team for a full week and had participated in the interviews and visits to rice gardens.

The rice survey in Madang was completed without much hurdle and was the most enjoyable amongst the five provinces despite the roughest road conditions to Lagaha village and the long distance drive from Madang to Usino-Bundi. Despite the tight schedule, the PDAL Advisor managed to take the survey team to the Bismarck Barramundi Breeding Center at Dylup Plantation and to St Benedict's Agricultural and

Technical Training Center on the North Coast. The latter is discussed in detail in Part II – Master Plan, Priority Projects.

Briefly, the reasons given by the PDAL team for the selection of Madang and Usino-Bundi Districts are as follows.

- i. Farming households have grown rice for food and small amount cash for the last two years in the selected villages. Other food production programmes such as poultry, carp and tilapia growing are well established along with cash crops such as cacao and vanilla in Madang District. There are plenty of settlers from inland mountainous areas along the highway in Usino-Bundi who are currently engaged in rice, peanut, vegetables, and garden fruits, poultry, and carp growing for food and cash.

*Usino - Bundi District-
Madang. Danaru village.
Chinese carp being fed
with termites*



- ii. Settler and indigenous farm households are growing rice and other food items at their own initiative and costs without receiving production inputs from the government. They have made their own wooden mortar and pestle and have cut the lower part of their jeans for rice de-husking. In villages in Usino-Bundi where shortage of arable land is common to all permitted settlers, crop rotation with peanuts is practiced in small plots that are under intensive cultivation. Farmers have manually constructed water supply for fishponds and poultry. Farmers have a farmers association and have a constructive dialogue link with district staff and LLG officials.
- iii. The administrative and political structures in these two selected districts and villages are well established and had been able to deliver services to majority of the villages. PDAL anticipated that any proposed project or donor assistance associated with the survey for strengthening rice promotion can be implemented successfully in the surveyed villages of these two districts.