

REPORT
OF
PROJECT FORMATION SURVEY MISSION
FOR
PAPUA NEW GUINEA

March, 1988

Japan International Cooperation Agency

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FOR
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FOREWORD

In April, 1986, the Japanese Ministry of Foreign Affairs sent a mission to Papua New Guinea to explain the mechanism of Japanese foreign aid in response to the Government of Papua New Guinea's announcement of its intention to review its policy on the acceptance of foreign aid in February of that year. Subsequently, the Japan International Cooperation Agency (JICA) sent a Study Team for Project Formation (Preliminary Study), headed by Atsuyoshi Toda, a JICA Development Specialist, to Papua New Guinea from November 26 to December 5, 1986 to identify Papua New Guinea's development requirements and priorities, for the preparation of the guidelines of Japanese cooperation with this country in the future.

Based on the Study Team's report a discussion was held between JICA, Japanese Ministry of Foreign Affairs and the First Assistant Secretary for Finance and Planning of the Government of Papua New Guinea on October 13, 1987. Following the results of these discussions, JICA sent the second Study Team for Project Formation (Follow-Up Study), again headed by Atsuyoshi Toda, to Papua New Guinea from February 23, to March 19, 1988 to search for possibilities of cooperation in the fields of telecommunication, land transportation, fisheries and agriculture which had been selected as the priority fields for Japanese development cooperation.

The present Report compiles the contents of the discussions between the Study Team and the various governmental organizations and concerned authorities in Papua New Guinea and the results of the field study. I would like to express my utmost gratitude to the Embassy of Japan and all other organizations and authorities who have extended their assistance in the execution of the Study.

March, 1988

Tomoya Kawamura
Executive Director
Japan International Cooperation Agency

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2. Background

(1) The Necessity of Dispatching Study Teams for the Formation and Preparation of Cooperation Projects

In many cases, the examination process of the requests from the developing countries for Japanese economic cooperation has not been proceeded satisfactorily because the Terms of References of such request have not provided sufficient information. Many project proposals were immature, lacking a clear indication of the project background, project objectives, project outline, and the composition as well as the role of the local government. Therefore, there has been an increasing need to reinforce the project formation process from the initial stage.

(2) The Basic Study for Project Formation

Given the above-stated background, the Basic Study Team for Project Formation (Preliminary Study), headed by Atsuyoshi Toda, a JICA Development Specialist, was sent to Papua New Guinea for the period between November 26 and December 5, 1986 to investigate the socio-economic conditions, the objective, and the strategy and priorities of the national development plan, and to analyze the long-term trends of the cooperation policy of the major donor-countries and international organizations, in order to identify the priority areas for future Japanese economic and technical cooperation with Papua New Guinea, taking into account the current conditions of Japanese foreign aid.

The study team has come to a preliminary conclusion that cooperation priorities be given to the fields of agriculture, forestry, fisheries, mining, transportation, energy and telecommunications, etc., and has identified the major sub-sectors of which the cooperation possibility is to be further examined.

Based on such preliminary conclusion, a meeting was held in Japan on October 13, 1987 between JICA, Japanese Ministry of Foreign Affairs and Mr. Roberto Igara, the First Assistant Secretary for Finance and Planning

of the Government of Papua New Guinea. Considering the aid commitments of the other donor countries, the meeting came to an agreement that a Follow-Up Study for Project Preparation, including technical analysis by consultants, would be undertaken in the fields of rural telecommunication, trans-island highway, coastal fisheries and rice development in order to formulate concrete ideas of possible future projects for Japan's cooperation.

Both sides came to an understanding that the purpose of this study was to examine technically the possibility for formulating cooperation projects based on existing project ideas in the above-mentioned sub-sectors, taking into account Papua New Guinea's development needs as well as the scope of Japan's economic and technical cooperation. It was also understood that, after due consultations with concerned parties in Japan, the study team would prepare draft terms of reference of the potential cooperation projects.

3. Results of the Present Study

While the present study examines the possibility of conducting master plan study as to the above-mentioned sub-sectors, the study results show that the master plan study for rural telecommunication would be the subject which has highest possibility for immediate cooperation.

With regard to fisheries, it seems necessary in the first place to undertake studies for the preparation of a basic development plan for coastal fisheries. And, within this framework, the development potential as well as concrete projects for the Milne Bay and Gulf Regions should be considered. However, the actual implementation of these studies should be considered from the medium- or long-term perspective after the cooperation in the rural telecommunication field.

Regarding the transportation sector, although a technical feasibility study, including the selection of possible construction methods, is proposed for the section between Mararaua and Aseki, the implementation of this study should also be considered from the medium- or long-term perspective.

As for rice development, the introduction of low-land rice seems desirable to replace the current up-land rice farming for achieving stable domestic rice production. However, land classification based on the present pattern of land use and soil conditions should be conducted to determine suitable farmland for low-land rice cultivation prior to examination of possible cooperation measures. This should also be subject to medium- or long-term planning.

4. Study Team Members

| | | |
|--|--------------------|---|
| Team Leader | Atsuyoshi Toda | Development Specialist, Japan International Cooperation Agency (JICA) |
| Cooperation Policy | Hiroshi Kurakata | Official, Development Cooperation Division, Economic Cooperation Bureau, Ministry of Foreign Affairs |
| Implementation Plan | Takayuki Sahara | Staff, Regional Study and Coordination Division, Planning Department, Japan International Cooperation Agency (JICA) |
| Telecommunications (Rural Telecommuni- cation) | Hiroshi Uchinuma | NTT International |
| Land Transportation (Inter-Island Highway) | Kishio Suzuki | International Development Center of Japan (IDCJ) |
| Fisheries (Coastal Fisheries) | Kazumi Iida | Overseas Agrof fisheries Consultant Co., Ltd. (OAFIC) |
| Agriculture (Rice Development) | Retangieppu Kuriki | International Development Center of Japan (IDCJ) |

5. Study Schedule

| <u>Date</u> | <u>Activities</u> |
|---------------------------|--|
| Feb. 23 (Tue) | Narita - Sydney (JL771) |
| 24 (Wed) | Sydney - Port Moresby (PX004) Team meeting and advance notification to Japanese Embassy |
| 25 (Thu) | Discussions on study subjects (methods and contents) at to Ministry of Finance and Planning. |
| 26 (Fri) | Participants from Papua New Guinea Side: Representatives of Departments of Foreign Affairs, Finance and Planning, Transport, Public Works, and Primary Industries, and Telephone Corporation, etc. Participants from Japanese Side: Study Team Members and Messrs. Iino (Counsellor), Watanabe (Third Secretary) and Nakano (Director of JICA Office) |
| 27 (Sat) | Review of collected data and information Meetings at Embassy and JICA Office |
| 28 (Sun) | Team meeting |
| 29 (Mon) | Port Moresby - Manila (PX010); Manila - Narita (JL742) (Messrs. Toda, Kurakata and Sahara) |
| Interviews by Consultants | |
| 29 (Mon) | Department of Primary Industries (Department of Agriculture and Livestock, Department of Fisheries and Marine Resources) Department of Public Works, Telephone Corporation, etc. |
| Mar. 1 (Tue) | Department of Primary Industries, Department of Public |

Works, Department of Transport, and Telephone Corporation, etc.

- 2 (Wed) Field survey - Messrs. Suzuki, Kuriki and Iida (Morobe, to East Sepik and Milne Bay Provinces) and Uchinuma,
5 (Sat) (Telephone Corporation and Bureau of Statistics at Port Moresby)
- 6 (Sun) Team meeting
- 7 (Mon) Field survey - Mr. Iida (Gulf Province)
to Messrs. Suzuki, Kuriki and Uchinuma - Review of
9 (Wed) collected data and information, and report writing
- 10 (Thu) Department of Primary Industries, Department of Transport, Department of Public Works, and Telephone Corporation, etc.
- 11 (Fri) As above
- 12 (Sat) Review of collected data and information and report writing
- 13 (Sun) As above
- 14 (Mon) Team meeting and report writing
- 15 (Tue) Report writing
- 16 (Wed) Meeting with Embassy staff
- 17 (Thu) As above
- 18 (Fri) Port Moresby - Sydney (PX001)
Sydney - Narita (QF021)
- 19 (Sat) Arrival at Narita

6. List of Interviewees

(Joint Interviews)

| | |
|-------------------|-------------------------|
| Chusaku Nomura | Ambassador |
| Kenro Iino | Counsellor |
| Akihisa Watanabe | Third Secretary |
| Hiroaki Takashima | Third Secretary |
| Katsuyasu Nakano | Director of JICA Office |

(Development Plan)

| | |
|-------------------|---|
| Mr. Roberto Igara | First Assistant Secretary, Foreign Aid Management, Department of Finance and Planning |
| Mrs. Fiu Williame | First Assistant Secretary, Department of Finance and Planning |
| Mr. George Paru | Officer, Department of Finance and Planning |
| Mr. R.J. Crothers | First Assistant Secretary, Department of National Planning and Development |

(Telecommunication Sector)

| | |
|----------------------|---|
| Mr. Ron M. Elias | Managing Director, Papua New Guinea Telephone Corporation |
| Mr. St. John Herbert | General Manager, Telecommunication Division, Papua New Guinea Telephone Corporation |
| Mr. John Kanblijambi | Corporate Secretary, Corporate Division, Papua New Guinea Telephone Corporation |
| Mr. Jim Bantegui | Executive Manager, Corporate Planning, Corporate Division, Papua New Guinea Telephone Corporation |

(Road Sector)

| | |
|-------------------|---|
| Mr. Michael Sharp | First Assistant Secretary, Operations, Department of Works, Borolo |
|-------------------|---|

Mr. Henry Parakei First Assistant Secretary,
Department of Transport

Mr. F. Leonardo Officer, Department of Transport

(Fishery Sector)

Mr. Oscar Natera Deputy Secretary,
Department of Fisheries and Marine
Resources

Mr. Noel Omeri Senior Resource Development Officer,
Department of Fisheries and Marine
Resources

Mr. Len Rodwell Chief Economist,
Department of Fisheries and Marine
Resources

Mr. Tatek Burak Fishery Economist,
Department of Fisheries and Marine
Resources

Mr. Wellington Verawa Secretary,
Milne Bay Province Government

Mr. Jeffrey Tauwaole Assistant Secretary,
Division of Primary Industry,
Milne Bay Province Government

Mr. Alphy Levi George First Assistant Secretary,
Planning and Coordination,
Milne Bay Province Government

Mr. Ope Oeaka Minister of Fisheries and Forest,
Gulf Province Government

Mr. Sari Tamasi Assistant Secretary,
Division of Primary Industry,
Gulf Province Government

Mr. John Morola First Assistant Secretary,
Planning and Technical Service,
Gulf Province Government

Mr. Herman Itagau Principal Project Officer,
Planning, Branch,
Gulf Province Government

Mr. Haro Mirou Provincial Fisheries Officer,
Gulf Province Government

Mr. George A. Mero Gulf Investment Corporation

(Agriculture Sector)

| | |
|--------------------|--|
| Mr. Tema Temu | First Assistant Secretary (Investment), Department of Agriculture and Livestock |
| Mr. Miri Setae | Director, Policy and Planning, Department of Agriculture and Livestock |
| Mr. John Mandich | Director, Food Management, Department of Agriculture and Livestock |
| Mr. Peter Boone | Director, Project Preparation, Department of Agriculture and Livestock |
| Mr. Juan Van Kamp | Assistant Director, Policy Planning and Coordination Division, Department of Agriculture and Livestock |
| Mr. Josiah Takuru | Officer, Department of Agriculture and Livestock |
| Mr. Japhet C. Gama | ERAP Research Station, DAL Food Management |
| Mr. Uvenama Rova | Assistant Secretary, Division of Primary Services, Morobe |
| Mr. Beka F. Seki | Coordinator, Division of Primary Services, Morobe |
| Mr. Will Akus | BUBIA Research Station, DAL Research |
| Mr. Felix Swanbau | Minister, Division of Primary Services, East Sepik |
| Mr. Ignas Benny | Assistant Secretary, Division of Primary Services, East Sepik |

7. Summary of Sub-Sector Studies

The technical aspects of rural telecommunication, land transportation, fisheries and agriculture in Papua New Guinea can be summarized follows.

(1) Telecommunication Sector (Rural Telecommunication)

Papua New Guinea has a relatively good telecommunications network in the urban areas. However, while the demand for telephones in the rural areas has a higher growth rate compared with the urban areas, the rural telephone network is still lagging behind due to the scattered location of a large number of villages and the topographical conditions. Although the Government of Papua New Guinea recognizes the necessity to consolidate the local telecommunications network, it has not yet reached the stage of selecting subject areas or of preparing a long-term plan for rural telephone network expansion.

Possible fields for cooperation: Master plan study for rural telephone network expansion.

(2) Road Sector (Inter-Island Highway)

Papua New Guinea is characterized by scattered islands, steep mountains, swamps and river systems with many small villages scattered all over the country. Consequently, the transportation network is poorly organized. Sea transportation is mainly used in the case of large consignments which cover limited areas and take time. Passenger transportation relies on air and roads but the former is too expensive for this country's average citizens. While there are roads along the coast and in parts of the highland, there are few roads in the mountainous areas which comprise most of the national land. The absence of a road connecting Port Moresby, the capital, and Lae, a large industrial city, is a typical example of the poor state of land transportation in Papua New Guinea.

Possible fields for cooperation: Development survey on road construction (Mararaua - Aseki).

(3) Fishery Sector (Coastal Fisheries)

Fish is an important source of protein, especially for those living along the coast. As the coastal areas of Papua New Guinea have rich marine resources, the development potential for fisheries is fairly large. Coastal fisheries resources, however, have been little exploited and most fishing activities are still at a low stage of development. The main factors preventing the development of fisheries are the difficulty of market participation, lack of production incentives, existence of complicated traditional fishing rights, and competition from imported marine products.

Possible fields for cooperation: Master plan study for the development of coastal fisheries.

(4) Agriculture Sector (Rice Development)

The major crops presently cultivated are coffee, cocoa and coconuts (above, cash crops), sweet potatoes, bananas, and rice (above, staple crops). While the former is exported, the production of the latter falls short of the domestic demand, necessitating substantial annual imports. The income revenue from exports continually increased up to 1980 but has since shown a downward trend due to the decline in international prices. The import value of meat, fish and rice has kept increasing, reflecting the upward trend of the domestic consumption. The extensive farming method is employed for both cash and staple crops and, therefore, the land productivity is far below the international standard.

Possible fields for cooperation: Land classification study (soil and topographical surveys), low-land rice production study, study related to agricultural research and technical extension services.

8-1. TELECOMMUNICATION SECTOR

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TELECOMMUNICATION SECTOR

I. PRESENT SITUATION OF RURAL TELECOMMUNICATION SERVICES

In search of possibilities and actual measures for the development of telecommunication services in Papua New Guinea, the mission has conducted a brief survey of the recent developments and present situation of telecommunications in the country's rural areas.

The survey has been carried out mainly through discussions with concerted authorities of the Post and Telecommunication Corporation, observations of major telecommunication installations, and review and analysis of various available documents and statistical data.

1. Telephone Service

The number of Direct Exchange Lines, telephone sets, and the total exchange capacity in 1987 were estimated at 30,428 (lines), 69,730 (sets), and 42,404 (lines), respectively. The number of DELs per 100 inhabitants slightly increased from 0.85 in 1983 to 0.86 in 1987, and consequently, created a telephone density of 1.96 per 100 inhabitants in 1987. A comparison of DELs diffusion rate in some selected countries is shown in Annex 1.

The distribution of telephone services in Papua New Guinea varies from region to region: the difference is especially prominent between urban and rural areas. Approximately 95 percent of the DELs are installed in the urban areas where the DELs density is about 6 per 100 inhabitants, or about 120 times that of the rural areas. It is estimated that the seven most populated urban areas are sharing 77 percent of the total installed DELs, and PORT MORESBY - the capital of the country - alone has a 37 percent share. Thus, it is obvious that about 90 percent of the whole population living in the rural areas are receiving only a small portion of the country's total DELs services.

The distribution of DELs by district from 1983 to 1987 is shown in Annex 2. The shares of the commercial sector, government sector, and household sector are approximately 38 percent, 24 percent, and 30 percent, respectively.

From 1983 to 1987, the number of DELs increased at an annual rate of 2.8 percent. It can be observed from the data in Annex 3 that the areas with less than 1,000 DELs installations have recorded a higher annual growth rate of DELs demand compared with the areas where many DELs are installed. The areas less than 1,000 DELs installation, including small urban and rural areas, indicate an average annual growth rate of 9.7 percent.

The above observations reveal that rural areas of Papua New Guinea have a large potential demand for telecommunication services. This potential demand is expected to further increase along with the socio-economic progress of the country.

2. Network Facilities and Development Plan

The telecommunication network in Papua New Guinea is illustrated in Annex 4. The exchange capacities and transmission system, of the telecommunication network, respectively, are shown in Annex 5. As shown in Annex 6 and Annex 7, primary bearers' routes which compose Boroko (in Port Moresby) - Lae - Goroka - Mt Hagen - Boroko in 960 or 1,260 channel per system is only looped in the truck network. However, the present network is essentially a star configuration with an inherent lack of alternative switching capabilities. The vulnerability of these networks is one of the major issues that PTC is facing. The capacity and the type of transmission routes are shown in Annex 6. The capacity, age, and type of the exchanges are shown in Annex 7. The small system, line concentrators, single channel and so on, are shown in Annex 8, and Annex 9.

The existing telecommunication network is a mixture of old and new facilities. About 30 percent of the local routes and one half of the exchanges are more than ten years old. The whole present network is an

analogue system, including electronic analogue exchanges, except the digital transmission route between Port Moresby and Sogeri. The digitalization of the telecommunication network is still at preliminary stages in Papua New Guinea.

The Five Year Development Plan 1988-1992 (issued in 1988) has set out the guidelines for postal and telecommunication development. The World Bank has funded a consultancy for an overall network development plan and management review. This plan is aiming at expansion of the telecommunication network in the period 1989 - 1993 with indicators up to 2002.

3. Expansion of Network Services in the Rural Areas

A national population census was conducted in 1980 giving an overall picture of the country's regional population distribution. According to this census, the total population of PNG increased at an average annual rate of 2.3 percent in the period 1971 - 1980. From these statistics, it can be said that the country's total population is presently increasing at an annual growth rate of 2.1 - 2.3 percent.

In the National Population Census, those areas having a total population over 500 inhabitants and a population density over 195 inhabitants per square kilometer were classified in the urban category, and the remaining in the rural category. According to this classification, 87 percent of the country's total population are living in rural areas.

In rural areas, large, small towns and villages are scattered in wide areas. In some of the towns and villages, people could gather in such places as admission stations, aid posts, schools, small migrant settlements and so on. As mentioned above, telephone demand in rural areas is potentially very strong, in spite of not having a widely developed telephone service due to a lower population density, geographical conditions, etc. In particular, the potential demand for common usage telephone services are very high in such places where people gather in rural areas.

In 1987, PTC had already commenced village pay-phone services - public coin telephone services - by using single channel radio system and solar battery system in a village, temporarily.

Furthermore, in March 1988, PTC expanded its services in other villages, situated far from the urban centers. According to the Five Year Development Plan in PTC, this system will be introduced gradually over a five-year period. Needless to say, this is one of the rural telecommunication systems. By reason of tenuous population density in rural areas, generally, the capacity of network facilities would be sufficed by small systems like single channel pay-phone.

The four telecommunication network models in rural areas, which are recommended in the Study Committee on Rural Telecommunications established by the Japanese Ministry of Posts and Telecommunication in 1984 (Annex 10), are as follows:

- 1) Model A (Crowded-type); the area where the population density is comparatively high for a rural area and where the distances between neighboring villages is rather short.
- 2) Model B (Mountainous-type); the area where villages are separated by mountains or hills, or where a village itself is located on a mountain or hill.
- 3) Model C (Riverside-type); the area where villages are scattered along a river or on a road.
- 4) Model D (Dispersion-type); the area where the population density is low and spread out over a wide area.

For the application of these models to rural areas of PNG, Model D should be utilized as the Basic Models. Model D is to be combined with other Models and to produce following types. Namely, Model A' (Semi-dispersion type): for central urban areas of lower rank population and encircling, like satellite town, large-middle villages in a radius of 15 to 20 kilometers.

Model B' (Mountainous and Semi-Crowded type); for an area where villages are separated by mountains or hills, or for a village located on a mountain or hill. Most of the country falls into this category.

Model C' (Seashore type); for an area of low population density spread out over a wide area and scattered along a seashore (similar to the riverside Model C).

These are solely models. Actual network planning should consider technical, economical and social aspects: connectability with the existing PTC network, maintenance condition, operation management demand and local conditions, etc.

At present, the fundamental planning and development strategy is required in order to prioritize the suitable area and method for the development of rural telecommunications network. Undermentioned are the Terms of Reference of the proposed study for the masterplan for rural telecommunications.

II. RURAL TELECOMMUNICATION STUDY IN PAPUA NEW GUINEA

- TERMS OF REFERENCE

1. Background

In Papua New Guinea, like in other developing countries, the telecommunication development is expected to bring about numerous favorable impacts on the country's political, economic and social activities.

The Post and Telecommunication Corporation (PTC) which is in charge of activities related to telecommunications in PNG has established a Five Year Development Plan, 1988-1993, and an overall indicative network development plan up-to 2002, including management policy, and telecommunication service improvement measures.

The condition of the telephone services in 1987 can be well-presented by the following indicators: 27,569 lines DELs (Direct Exchange Lines), 63,356 telephone sets, 52 exchange offices, 0.9 percent of DELs/100 inhabitants. On the other hand, from the point of view of telephone service distribution between rural and urban areas, it is evident that the DELs diffusion rate is extremely low in the rural areas compared to the urban areas, with the ratios in the former and the latter being estimated at 5% and 95% as compared to the population ratio of 87% and 13%, respectively.

The main reasons for the backwardness of rural telecommunication development seem to be (1) small sizes of most towns, (2) numerous small villages scattered in large areas, and (3) existence of hills and valleys throughout the country. However, it is observed that the annual growth rate of the number of installed DELs tends to be higher in small urban areas (including rural areas) with an average annual growth rate of 9.7% over the period 1983-1987 as compared to 2.3% for middle and large urban areas, and 2.8% for the whole country in the same period.

As indicated above, the demand for telephone services in the rural areas, although still small in quantity, has rapidly increased and will

seemingly continue to increase at a fast pace because of the large population and economic development potential in these areas. The development and expansion as rural telecommunication services in turn would contribute much to the materialization of the rural areas' development potential.

These Terms of Reference are concerned with a master plan study for the long-term rural telecommunication network development in Papua New Guinea, aiming to expand the rural telecommunication network.

2. Objectives

This study aims to prepare long-term development plan for rural telecommunications network with A.D. 2005 as the target year for completion, and to propose short-term plan for priority area identified in the long-term development plan.

3. Scope of Works

3.1 General

The Study Team should undertake studies on the present economic conditions, telecommunication services demand, financial and organizational aspects and related matters to fulfill the study purpose stated in Part 2.

In the conduct of this work, the Study Team should fully cooperate with the PNG Government and the Authorities of PTC, which, in turn, shall provide all necessary assistance to conduct the studies on matters as outlined in Part 5 of Terms of Reference.

3.2 Study Items

On a rural telecommunications network,

- 1) Selection of the candidate areas and determination of development priorities among such areas

- 2) Prediction analysis of expected subscriber demand and expected traffic demand for the candidate areas
- 3) Long-term development plan concerning the expansion of the rural telecommunication network
- 4) Speech quality, improvement plan of network reliability and operation/maintenance conditions
- 5) New service demand outside of telephone service demand and its long-term prediction
- 6) Financial prediction and expenses plan in the long-term development plan
- 7) Other items which should be considered for the implementation of the long-term development plan

4. Period of Study

Period: about 1 year

5. Composition of the Study Team

The study team should consist of qualified members to cover the following subjects:

- 1) Network engineering
- 2) Exchange engineering
- 3) Transmission engineering
- 4) Outside plant engineering
- 5) Traffic forecast
- 6) Financial and economic analysis (economic conditions, cost-benefit analysis)

6. Report

The following reports shall be submitted to the Government of PNG, during the course of the study:

- (1) Inception Report ----- to be submitted at the beginning of the first field survey for Master Plan Study. This report shall contain the schedule and methodology of the study as well as details of the field survey programs to be carried out. Twenty (20) copies of this report shall be submitted.
- (2) Interim Report ----- to be submitted at the end of the sixth month. This report shall outline in detail the findings and preliminary conclusion as well as the framework of the Master Plan to be proposed. The basic issues related to the Master Plan as well as decisions required from the PNG Government responsible for the implementation of this study should be outlined clearly so that appropriate decision can be made in a speedy manner so as to ensure smooth progress of the study. Twenty (20) copies of this report shall be submitted.
- (3) Draft Final Report ----- to be submitted at the middle of the tenth month. This report shall outline the result of the study carried out, the various alternatives evaluated as well as all details of the recommended Master Plan proposed as outlined in the scope of the study section of this terms of reference. It shall also outline the details of the short-term plan recommendations. This report will be reviewed by the PNG Government and the outcome of such reviews will be conveyed within two (2) weeks from the date of receipt of the report. Twenty (20) copies of this report shall be submitted.
- (4) Final Report ----- to be submitted at the end of the twelfth month. All comments given by the PNG Government on the draft final report should be responded in the preparation of the final report. Forty (40) copies of this report shall be submitted.

7. Facilities to be Provided by the PNG Government

The PNG Government will be responsible for:

- 1) Provision of statistic data and information,
- 2) Assignment of PNG counterparts for the study team, and
- 3) Provision of necessary support to the team (including office space, meeting rooms, guidance in field trip, etc.) for the study team.

Main Services (1)

(end of 1987)

| Item | Number |
|--|--------|
| Telephone ssets (A) | 69,730 |
| Telephone sets per 100 persons ((A)/100 persons) | 1.96 |
| Direct exchange lines (B) | 30,428 |
| Telephone diffusion rate ((B)/100 persons) | 0.86 |
| Telephone subscriber demands | 1,997 |
| Exchange capacity | 42,404 |

Comparison of the Number of DELs
Among the Neighboring Developing Countries

| Country | Inhabitants (million) | Telephone Sets (thousand) | DELs (thousand) | Telephone Sets / 100 Inhabitants | DELs / 100 Inhabitants |
|-------------|--------------------------|---------------------------------|--------------------|---|------------------------------|
| PNG | 3.2 | 51 | 25 | 1.58 | 0.85 |
| India | 716.7 | 3,238 | 2,466 | 0.45 | 0.34 |
| Indonesia | 153.0 | 669 | 475 | 0.43 | 0.36 |
| Malaysia | 14.7 | 977 | 700 | 6.65 | 4.76 |
| Pakistan | 88.9 | 474 | 384 | 0.53 | 0.31 |
| Philippines | 51.5 | 788 | 438 | 1.53 | 0.85 |
| Sri Lanka | 15.6 | 107 | 72 | 0.69 | 0.46 |
| Thailand | 49.5 | 623 | 463 | 1.26 | 0.94 |
| (Reference) | | | | | |
| Japan | 117.0 | 61,208 | 42,429 | 52.31 | 36.26 |

Telephone Exchange Statistics

| District and Exchanges | Direct Exchange Lines | | | | | Tele. Instruments 1986 |
|------------------------------|-----------------------|--------|--------|--------|--------|------------------------------|
| | 1983 | 1984 | 1985 | 1986 | 1987 | |
| <u>ARAWA</u> | | | | | | |
| Arawa | 1,632 | 1,637 | 1,635 | 1,791 | 1,804 | 2,695 |
| Buin | 52 | 56 | 42 | 44 | 46 | 102 |
| Buka | 83 | 89 | 91 | 95 | 98 | 132 |
| Kieta | 369 | 381 | 396 | 430 | 438 | 870 |
| Nairobi | 33 | 36 | 38 | 40 | 45 | 65 |
| Panguna | 274 | 327 | 291 | 303 | 301 | 392 |
| Sub Total | 2,443 | 2,527 | 2,493 | 2,703 | 2,732 | 4,255 |
| <u>GOROKA</u> | | | | | | |
| Goroka | 1,070 | 1,123 | 1,171 | 1,299 | 1,372 | 3,052 |
| Kainantu | 157 | 163 | 193 | 206 | 210 | 551 |
| Kundiawa | 189 | 205 | 209 | 226 | 267 | 690 |
| Sub Total | 1,416 | 1,491 | 1,573 | 1,731 | 1,849 | 4,293 |
| <u>LAE</u> | | | | | | |
| Bulolo | 133 | 108 | 128 | 110 | 123 | 271 |
| Finschhafen | 59 | 73 | 60 | 65 | 69 | 122 |
| Lae | 3,374 | 3,413 | 3,612 | 3,871 | 4,133 | 8,526 |
| Taraka | 341 | 343 | 381 | 417 | 421 | 500 |
| Wau | 126 | 125 | 153 | 146 | 153 | 190 |
| Sub Total | 4,033 | 3,594 | 4,334 | 4,609 | 4,899 | 9,609 |
| <u>MADANG</u> | | | | | | |
| Lorengau | 180 | 148 | 211 | 216 | 234 | 471 |
| Madang | 1,051 | 1,100 | 1,146 | 1,222 | 1,261 | 2,545 |
| Sub Total | 1,231 | 1,248 | 1,357 | 1,438 | 1,495 | 3,016 |
| <u>MT HAGEN</u> | | | | | | |
| Banz | 94 | 102 | 112 | 133 | 109 | 172 |
| Kagamuga | 137 | 136 | 171 | 188 | 208 | 366 |
| Kiunga | 68 | 80 | 119 | 127 | 150 | 191 |
| Mendi | 231 | 228 | 246 | 264 | 255 | 399 |
| Minj | 39 | 38 | 39 | 39 | - | 83 |
| Mt Hagen | 808 | 844 | 890 | 1,047 | 1,195 | 2,456 |
| Tabubil | 32 | 32 | 212 | 235 | 310 | 390 |
| Tari | 119 | 141 | 40 | 45 | 65 | 52 |
| Wabag | 148 | 161 | 152 | 157 | 177 | 295 |
| Wapenamanda | 25 | 24 | 44 | 39 | 45 | 41 |
| Sub Total | 1,701 | 1,786 | 2,025 | 2,274 | 2,514 | 4,445 |
| <u>PORT MORESBY</u> | | | | | | |
| Alotau | 199 | 206 | 216 | 254 | 293 | 459 |
| Bereina | 13 | 15 | 15 | 19 | 18 | 40 |
| Bomana | 193 | 202 | 210 | 188 | 199 | 553 |
| Boroko | 6,884 | 7,125 | 6,937 | 6,561 | 7,240 | 18,427 |
| Daru | 100 | 117 | 117 | 154 | 173 | 294 |
| Ela Beach | 2,693 | 2,760 | 2,847 | 3,204 | 3,643 | 8,263 |
| Gerehu | 460 | 418 | 432 | 454 | 544 | 736 |
| Kerema | 106 | 110 | 108 | 134 | 114 | 229 |
| Kupiano | 44 | 37 | 36 | 35 | 36 | 43 |
| Kwikila | 24 | 28 | 25 | 26 | 28 | 32 |
| Popondetta | 300 | 314 | 303 | 274 | 356 | 662 |
| Samarai | 44 | 36 | 31 | 26 | 32 | 45 |
| Sogeri | 37 | 36 | 27 | 37 | 36 | 41 |
| Sub Total | 11,097 | 11,404 | 11,304 | 11,366 | 12,712 | 29,824 |
| <u>RABAU</u> | | | | | | |
| Bialla | 48 | 59 | 80 | 88 | 94 | 80 |
| Kavieng | 230 | 232 | 250 | 259 | 264 | 544 |
| Kerevat | 37 | 41 | 40 | 40 | 53 | 92 |
| Kimbe | 333 | 372 | 411 | 434 | 475 | 871 |
| Kokopo | 102 | 27 | 154 | 152 | 154 | 195 |
| Namatanai | 31 | 30 | 49 | 53 | 52 | 81 |
| Rabaul | 1,583 | 1,526 | 1,659 | 1,716 | 1,858 | 3,624 |
| Toleap | 113 | 107 | 121 | 113 | 123 | 274 |
| Sub Total | 2,477 | 2,394 | 2,764 | 2,855 | 6,293 | 5,761 |
| <u>WEWAK</u> | | | | | | |
| Aitape | 47 | 56 | 64 | 58 | 63 | 54 |
| Angoram | 17 | 16 | 34 | 34 | 36 | 33 |
| Maprik | 61 | 60 | 59 | 55 | 70 | 230 |
| Vanimo | 32 | 37 | 220 | 223 | 212 | 317 |
| Wewak | 624 | 646 | 768 | 763 | 773 | 1,519 |
| Sub Total | 781 | 815 | 1,145 | 1,133 | 1,154 | 2,153 |
| PNG TOTAL | 25,179 | 25,981 | 26,996 | 28,109 | 30,428 | 63,356 |

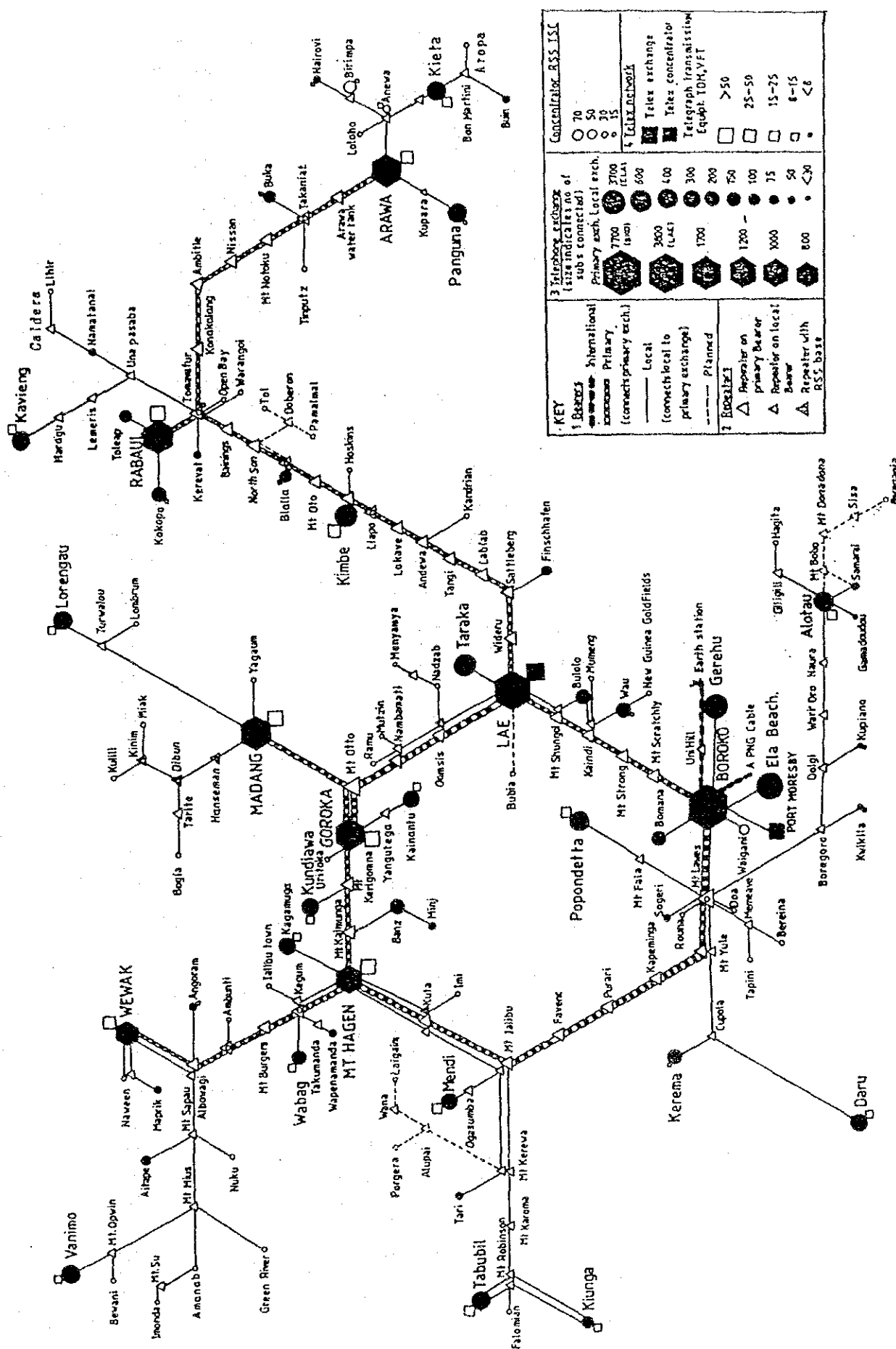
Annual Growth Rate (1983-1987) of Direct Exchange Lines

| No. of DELs in 1983 | More than 1,000 lines | From 100 lines to 1,000 lines | Less than 100 lines | PNG Total |
|---------------------------|--------------------------|----------------------------------|------------------------|--------------|
| Annual growth rate (%) | 1.84 | 4.81 | 9.7 | 2.7 |
| No. of exchange | 9 | 22 | 21 | 52 |

Note: BOROKO, ELA BEACH and GEREHU are same area, and so are counted in the item of more than 1,000 lines.
LAE, TARAKA are same area, and so are counted in the item of more than 1,000 lines.

PNG Telecommunication Network 1987

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Transmission Systems

(1) Primary Bearers

| Route | | Capacity |
|----------|------------------------------------|----------|
| LAE | - Boroko | 1,260 |
| | - Goroka | 1,260 |
| | - Rabaul | 960 |
| GOROKA | - Madang | 960 |
| | - Mt Hagen | 1,260 |
| MT HAGEN | - Boroko | 1,260 |
| | - Wewak | 960 |
| BOROKO | - Gerehu (Satellite Earth Station) | 960 |
| | - Mt Lawes | 1,800 |
| RABAUL | - Arawa | 960 |

(2) Local Bearers

(2-1) Small Capacity Microwave Bearers

| Route | | Type | Capacity |
|--------------|---------------|----------------|----------|
| MT LAWES | - Alotau | TELETTTRA | 300 |
| | - Cupola | TELETTTRA | 120 |
| | - Kwikila | TELETTTRA | 120 |
| | - Kupiano | TELETTTRA | 120 |
| | - Popondetta | TELETTTRA | 300 |
| | - Sogeri | NEC 4M/BIT | 120 |
| MT SHUNGOL | - Bulolo | TELETTTRA | 120 |
| MT NAMBAMATI | - Ramu | NEC TRS-FM120 | 120 |
| MT YANGUTEGA | - Kainantu | STC ML1 | 24 |
| MT KERIGOMNA | - Kundiawa | TELETTTRA | 120 |
| MT KAIMUNGA | - Banz | TELETTTRA | 120 |
| MT IALIBU | - Mendi | TELETTTRA | 120 |
| MT ROBINSON | - Kiunga | THOMSON-CSF | 300 |
| MT ROBINSON | - Tabubil | THOMSON-CSF | 300 |
| MT KEGUM | - Wabag | TELETTTRA | 120 |
| | - Wapenamanda | MSK | 10 |
| MT ALBOWAGI | - Angoram | STC ML1 | 24 |
| MT SAPAU | - Aitape | THOMSON-CSF | 120 |
| | - Nuku | THOMSON-CSF | 120 |
| | - Green River | THOMSON-CSF | 120 |
| | - Amanab | THOMSON-CSF | 120 |
| MT SU | - Imonda | THOMSON-CSF | 120 |
| MT OPWIN | - Bewani | THOMSON-CSF | 120 |
| ANDEWA | - Kandrian | TELETTTRA | 120 |
| KIMBE | | TELETTTRA | 300 |
| UNA PASABA | - Namatanai | THOMSON-CSF | 120 |
| ANEWA | - Kieta | FARINON SS2000 | 300 |
| KUPARA | - Panguna | FARINON SS2000 | 120 |
| TAKANIAT | - Tinputz | THOMSON-CSF | 120 |
| MT MUSE | - Vanimo | THOMSON-CSF | 300 |
| MT KERAWA | - Tari | TELETTTRA | 120 |
| MT MARAGU | - Kavieng | THOMSON-CSF | 300 |

(2-2) Small Capacity UHF Bearers

| | Route | Type | Capacity |
|--------------|-----------------|-------------------|----------|
| MT LAWES | - Doa | NEC TR4-PM6 | 6 |
| | - Memeave | NEC TR4-FM60 | 60 |
| | - Rouna | NEC TR4-PM6 | 6 |
| MEMEAVE | - Bereina | MSK | 5 |
| | - Tapini | MSK | 5 |
| CUPOLA | - Kerema | GRANGER TROPO | 24 |
| ALOTAU | - Samarai | NEC TR4-FM60 | 60 |
| | - Gamadoudou | NEC TR4-PM6 | 6 |
| MT KAINDI | - Mumeng | GEC | 5 |
| | - Wau | GEC | 15 |
| MT NAMBAMATI | - Mutzin | NEC TR5-FM120 | 120 |
| OOMSIS | - Nadzab | NEC TR5-FM120 | 120 |
| SATTELBURG | - Finschafen | NEC TR4-FM60 | 60 |
| WAU | - Wau Goldfield | NEC TR4-PM6 | 6 |
| NADZAB | - Menyamya | NOKIA FM4-430 | 4 |
| MADANG | - Hansemen | NEC TR5-FM120 | 120 |
| HANSEMEN | - Dibun | NEC TR5-FM120 | 120 |
| DIBUN | - Bogia | NEC TR4-FM60 | 60 |
| | - Kinim | NEC TR4-FM60 | 60 |
| KINIM | - Miak | NEC TR4-PM6 | 6 |
| | - Kulili | NEC TR4-PM6 | 6 |
| YABOB | - Yagaum | MSK | 5 |
| AMBUNTI | - Maprik | NEC TR4-FM60 | 60 |
| GOROKA | - Uritoka | NEC TR4-FM12 | 12 |
| MT HAGEN | - Kagamuga | NEC TR5-FM120 | 120 |
| MT KEGUM | - Ialibu | NEC TR4-FM60 | 60 |
| | - Imi | NEC TR5-FM120 | 120 |
| MT ROBINSON | - Falomian | NEC TR4-FM60 | 60 |
| TOMAVATUR | - Kokopo | NEC TR4-PM6 | 6 |
| NAMATANAI | - Lihir | NOKIA FM4-430 | 4 |
| LORENGAU | - Lombrum | NEC TR4-PM6 | 6 |
| TOMAVATUR | - Warangoi | NEC TR4-PM6 | 6 |
| MT KEREWA | - Porgera | NOKIA FM4-430/160 | 8 |
| TARI | - Bphides | NOKIA FM4-160 | 4 |
| MADANG | - Lorengau | GRANGER TROPO | 24 |

Note: AGE of the equipment are as follows:

- Less than 7 - 8 years: NEC TR - FM
NOKIA FM
THOMSON-CSF
- About 10 years : FAROMPM SS2000
TELETTRA
GEC
MSK
- More than 14-15 years: GRANGER
STC ML

Telephone Exchanges

| Exchange | Population | Type | Age of Ex. (yr) | Capacity | Full (8) |
|-------------------|------------|----------|-----------------|----------|----------|
| PORT MORESBY AREA | 123,624 | - | - | - | - |
| Boroko | 66,457 | ARF | 19 | 2,000L | 82.3 |
| Ela Beach | 37,206 | ARE-11 | 5 | 5,000L | 74.9 |
| Gerehu | 14,761 | ARE-11 | 4 | 1,800L | 30.7 |
| Bomana | 4,148 | ARK-521M | 17 | 400L | 53.5 |
| LAE AREA | 61,617 | - | - | - | - |
| Lae | 45,336 | ARF | 14 | 4,600L | 84.6 |
| Taraka | 16,281 | MCR | 4 | 512L | 85.3 |
| Madang | 21,335 | ARF | 19 | 1,600L | 82.7 |
| Wewak | 19,890 | ARF | 14 | 1,000L | 77.3 |
| Goroka | 18,511 | ARF | 13 | 2,000L | 70.3 |
| Rabaul | 14,954 | ARF | 12 | 2,400L | 80.2 |
| Mt Hagen | 13,441 | ARF | 13 | 2,000L | 65.0 |
| Arawa | 12,588 | ARF | 14 | 2,000L | 90.6 |
| Daru | 7,128 | ARK-522M | 10 | 300L | 59.0 |
| Bololo | 6,730 | ARK-522M | 19 | 200L | 44.0 |
| Popondetta | 6,429 | ARK-521M | 12 | 500L | 74.6 |
| Kimbe | 4,662 | ARK-521M | 12 | 600L | 83.3 |
| Kavieng | 4,633 | ARK-522M | 9 | 400L | 72.2 |
| Alotau | 4,311 | ARK-522M | 8 | 400L | 78.7 |
| Kundiawa | 4,299 | ARK-521M | 12 | 400L | 69.0 |
| Mendi | 4,130 | ARK-521M | 12 | 400L | 71.2 |
| Lorengau | 3,986 | ARK-522M | 9 | 400L | 60.0 |
| Kainantu | 3,779 | ARK-521M | 12 | 300L | 71.3 |
| Pauguna | 3,566 | ARK-521M | 14 | 400L | 79.0 |
| Kieta | 3,491 | ARK-521M | 14 | 500L | 89.4 |
| Aitape | 3,308 | MCR | 3 | 128L | 49.2 |
| Kerema | 3,389 | ARK-521M | 12 | 200L | 58.0 |
| Vanimo | 3,071 | ARK-521M | 10 | 300L | 76.3 |
| Wau | 2,349 | ARK-521M | 19 | 200L | 80.0 |
| Kokopo | 2,167 | MCR | 4 | 256L | 66.4 |
| Wabag | 1,518 | ARK-522M | 9 | 200L | 71.0 |
| Angoram | 1,846 | ARK-521M | 14 | 100L | 38.0 |
| Buka | 1,518 | ARK-522M | 9 | 200L | 53.0 |
| Kiunga | 1,407 | MCR | 8 | 256L | 54.0 |
| Sogeri | 1,139 | RURAX | 21 | 100L | 39.0 |
| Maprik | 1,121 | MCR | 2 | 100L | 54.6 |
| Kagamuga | 1,117 | MCR | 4 | 384L | 61.4 |
| Kwikila | 1,022 | ARK-522M | 7 | 100L | 28.0 |
| Kupiano | 948 | ARK-522M | 8 | 100L | 47.0 |
| Banz | 913 | MCR | 4 | 256L | 55.0 |
| Minz | 898 | RURAX | 16 | 50L | - |
| Kerevat | 894 | ARK-521M | 1 | 100L | 55.0 |
| Buin | 885 | ARK-522M | 8 | 100L | 51.0 |
| Samarai | 864 | RURAX | 22 | 100L | 32.0 |
| Finschhafen | 756 | ARK-521M | 14 | 100L | 77.0 |
| Namatani | 753 | MCR | 2 | 128L | 41.4 |
| Wapenamanda | 739 | ARK-521M | 9 | 100L | 45.0 |
| Tari | 616 | MCR | 3 | 128L | 58.5 |
| Bereina | 583 | RURAX | 9 | 50L | 36.0 |
| Toleap | 280 | ARK-521M | 14 | 230L | 57.8 |
| Tabubil | 211 | MCR | 2 | 256L | 91.4 |
| Bialla | 202 | ARK-522M | 5 | 200L | 50.0 |
| Nairovi | 66 | ARK-521M | 14 | 100L | 50.0 |

Note: The order of station name is subjected to the number of population (PNG country statistical data in 1980), and is not subjected to the DELs.

ARF, ARK are cross bar switch (made in LME company) and MCR, ARE11 are electronic automatic exchange (analogue type).

Small Systems (1)
TSCU's and Line Concentrators

| Exchange | Type | Capacity | Connected | Full (%) |
|--------------------------|------|----------|-----------|----------|
| ARAWA DISTRICT | | | | |
| Anewa Bay | TSCU | 45 | 36 | 80.0 |
| Aropa | TSCU | 25 | 20 | 80.0 |
| Birempa | L/C | 80 | 67 | 83.7 |
| Birempa | TSCU | 20 | 20 | 100.0 |
| Nairovi | TSCU | 5 | 2 | 40.0 |
| Panguna | TSCU | 5 | 5 | 100.0 |
| Tinputz | TSCU | 20 | 20 | 100.0 |
| District Total | | 200 | 170 | |
| GOROKA DISTRICT | | | | |
| Goroka | TSCU | 10 | 10 | 100.0 |
| Yonki | TSCU | 5 | 5 | 100.0 |
| District Total | | 15 | 15 | |
| MT HAGEN DISTRICT | | | | |
| Ialibu | TSCU | 21 | 19 | 90.4 |
| Imi | TSCU | 24 | 18 | 87.5 |
| Mioj | TSCU | 59 | 42 | 77.9 |
| District Total | | 104 | 79 | |
| LAE DISTRICT | | | | |
| Gusap | TSCU | 10 | 8 | 90.0 |
| Gusap | L/C | 40 | 17 | 42.5 |
| Menyanya | TSCU | 10 | 5 | 50.0 |
| Mumeng | TSCU | 5 | 3 | 80.0 |
| Mutzin | TSCU | 10 | 7 | 100.0 |
| District Total | | 75 | 40 | |
| MADANG DISTRICT | | | | |
| Bogia | TSCU | 12 | 12 | 100.0 |
| Dibun | TSCU | 5 | 2 | 40.0 |
| Hansemam | TSCU | 5 | 5 | 100.0 |
| Kaviek | TSCU | 5 | 5 | 100.0 |
| Kinim | TSCU | 12 | 12 | 100.0 |
| Kulili | TSCU | 5 | 5 | 100.0 |
| Lombrum | TSCU | 5 | 5 | 100.0 |
| Tarite | TSCU | 5 | 3 | 60.0 |
| District Total | | 54 | 49 | |

| Exchange | Type | Capacity | Connected | Full (%) |
|------------------------------|------|----------|-----------|----------|
| PORT MORESBY DISTRICT | | | | |
| Tapini | TSCU | 5 | 5 | 100.0 |
| Waigani | L/C | 80 | 17 | 21.2 |
| District Total | | 85 | 22 | |
| RABAU DISTRICT | | | | |
| Kandrian | TSCU | 24 | 18 | 75.0 |
| Rabaul | TSCU | 24 | 22 | 91.6 |
| Tomavatur | L/C | 40 | 18 | 45.0 |
| Watongoi | L/C | 40 | 18 | 45.0 |
| District Total | | 128 | 76 | |
| WEWAK DISTRICT | | | | |
| Amanab | TSCU | 10 | 8 | 100.0 |
| Ambunti | TSCU | 19 | 19 | 100.0 |
| Bewani | TSCU | 10 | 2 | 100.0 |
| Green River | TSCU | 10 | 7 | 100.0 |
| Imonda | TSCU | 10 | 2 | 100.0 |
| Nuku | TSCU | 10 | 9 | 100.0 |
| District Total | | 69 | 47 | |
| PNG TOTAL | | | | |
| | | 730 | 498 | |

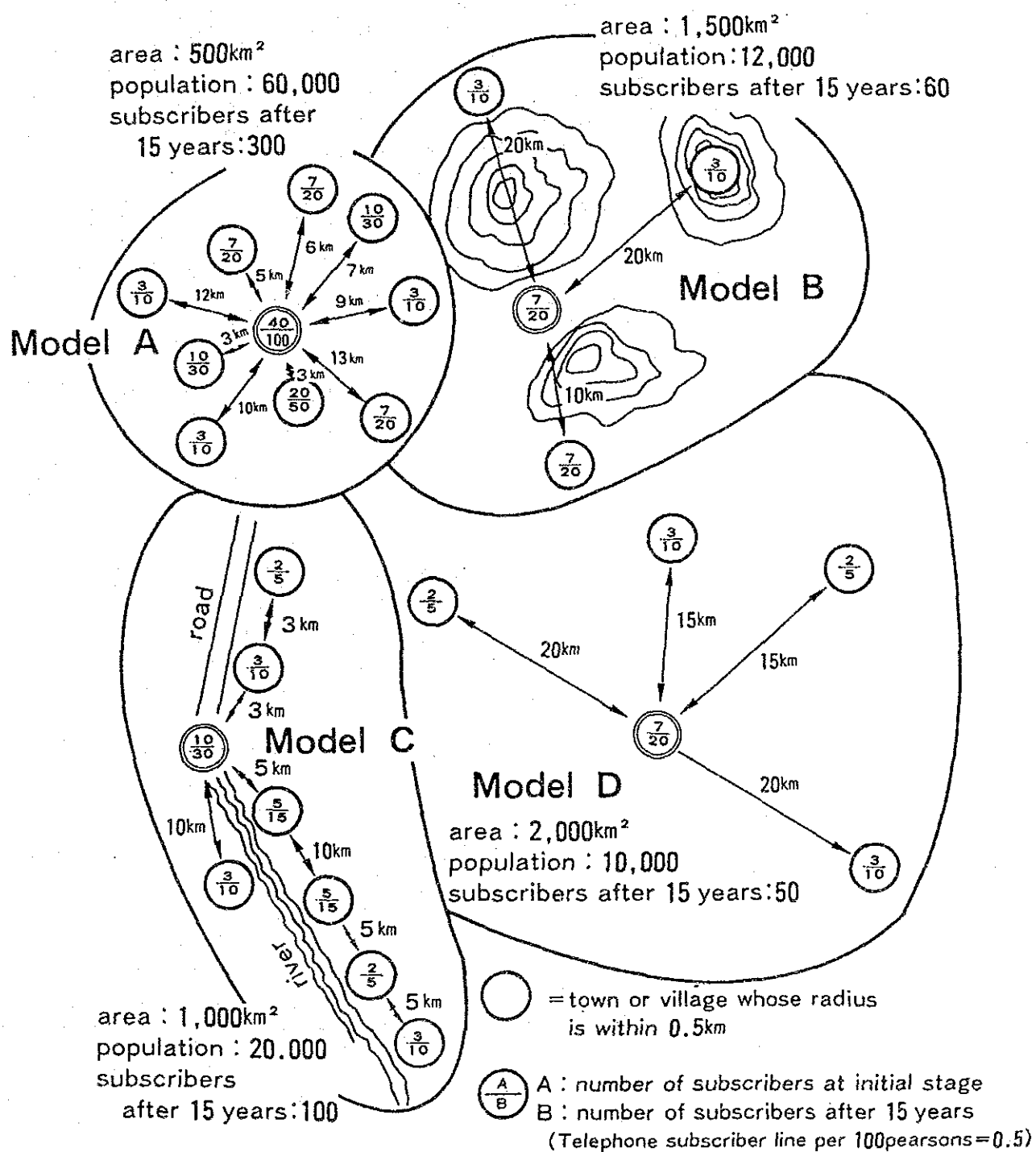
Note: TSCU is a subscriber line 6W/4W converter.
L/S is a line concentrator.

Small Systems (2)
RSS, FM880, SR10, TR4E1 & TR3E1

| Exchange | Type | Capacity | Connected | Full (%) |
|------------------------------|-------|----------|-----------|----------|
| ARARA DISTRICT | | | | |
| Anewa Bay | FM880 | 4 | 4 | 100.0 |
| Atewa | FM880 | 1 | 1 | 100.0 |
| Bon Martini | SR10 | 1 | 1 | 100.0 |
| Bon Martini | FM880 | 1 | 1 | 100.0 |
| Buka | FM880 | 2 | 2 | 100.0 |
| Kieta | FM880 | 1 | 1 | 100.0 |
| Takaniat | RSS | 48 | 48 | 100.0 |
| District Total | | 58 | 58 | |
| GOROKA DISTRICT | | | | |
| Goroka | FM880 | 6 | 6 | 100.0 |
| Xainantu | FM880 | 5 | 5 | 100.0 |
| Xainantu | TR4E1 | 1 | 1 | 100.0 |
| Kundiawa | FM880 | 9 | 9 | 100.0 |
| Mt Gua | FM880 | 1 | 1 | 100.0 |
| Mt Kias | RSS | 48 | 36 | 89.5 |
| District Total | | 71 | 59 | |
| MT HAGEN DISTRICT | | | | |
| Banz | FM880 | 1 | 1 | 100.0 |
| Kuta Ridge | RSS | 48 | 32 | 66.6 |
| Mendi | FM880 | 1 | 1 | 100.0 |
| Mt Hagen | FM880 | 2 | 2 | 100.0 |
| Mt Kegum | RSS | 48 | 44 | 91.6 |
| Mt Kegum | FM880 | 2 | 2 | 100.0 |
| Mt Kerowa | FM880 | 3 | 3 | 100.0 |
| Tari | FM880 | 3 | 3 | 100.0 |
| District Total | | 108 | 88 | |
| LAE DISTRICT | | | | |
| Bulolo | FM880 | 1 | 1 | 100.0 |
| Finschhafen | SR10 | 2 | 2 | 100.0 |
| Finschhafen | FM880 | 1 | 1 | 100.0 |
| Lae | SR10 | 1 | 1 | 100.0 |
| Mt Lunan | FM880 | 1 | 1 | 100.0 |
| Mt Sattleburg | SR10 | 2 | 2 | 100.0 |
| Nadzab | SR10 | 1 | 1 | 100.0 |
| Oomsia | RSS | 48 | 43 | 93.7 |
| Ramu | FM880 | 4 | 4 | 100.0 |
| District Total | | 61 | 58 | |
| MADANG DISTRICT | | | | |
| Bogia | FM880 | 2 | 2 | 100.0 |
| Hansen | FM880 | 2 | 2 | 100.0 |
| Hansen | TR4E1 | 1 | 1 | 100.0 |
| Kulili | SR10 | 1 | 1 | 100.0 |
| Lorengau | FM880 | 2 | 2 | 100.0 |
| Madang | RSS | 48 | 19 | 39.5 |
| Madang | FM880 | 1 | 1 | 100.0 |
| Madang | TR3E1 | 1 | 1 | 100.0 |
| Tarite | SR10 | 1 | 1 | 100.0 |
| Tarite | FM880 | 1 | 1 | 100.0 |
| District Total | | 60 | 31 | |
| PORT MORESBY DISTRICT | | | | |
| Alotau | FM880 | 8 | 8 | 100.0 |
| Alotau | TR4E1 | 6 | 6 | 100.0 |
| Bomana | FM880 | 1 | 1 | 100.0 |
| Burns Peak | FM880 | 2 | 2 | 100.0 |
| Cupola | FM880 | 1 | 1 | 100.0 |
| Kapimenga | FM880 | 1 | 1 | 100.0 |
| Kupiano | SR10 | 1 | 1 | 100.0 |
| Kwikila | SR10 | 2 | 2 | 100.0 |
| Meneave | SR10 | 2 | 2 | 100.0 |
| Mt Lawes | RSS | 48 | 47 | 97.9 |
| Mt Lawes | FM880 | 1 | 1 | 100.0 |
| Mt Lawes | SR10 | 2 | 2 | 100.0 |
| Mt Yule | FM880 | 2 | 2 | 100.0 |
| Page Hill | RSS | 24 | 10 | 41.6 |
| Page Hill | FM880 | 3 | 3 | 100.0 |
| Popondetta | RSS | 48 | 8 | 16.6 |
| Popondetta | SR10 | 1 | 1 | 100.0 |
| Samarai | FM880 | 5 | 5 | 100.0 |
| Sogerit | TR4E1 | 1 | 1 | 100.0 |
| District Total | | 159 | 104 | |
| RABUL DISTRICT | | | | |
| Blalia | FM880 | 5 | 4 | 80.0 |
| Blalia | SR10 | 1 | 1 | 100.0 |
| Kavieng | FM880 | 1 | 1 | 100.0 |
| Kimbe | FM880 | 2 | 2 | 100.0 |
| Kimbe | SR10 | 1 | 1 | 100.0 |
| Liapo | RSS | 48 | 30 | 62.5 |
| Namatanai | SR10 | 1 | 1 | 100.0 |
| Rabaul | RSS | 60 | 51 | 85.0 |
| Rabaul | FM880 | 9 | 9 | 100.0 |
| Rabaul | SR10 | 1 | 1 | 100.0 |
| District Total | | 129 | 101 | |
| WEWAK DISTRICT | | | | |
| Aitape | SR10 | 1 | 1 | 100.0 |
| Angoram | FM880 | 2 | 2 | 100.0 |
| Maprik | FM880 | 4 | 3 | 75.0 |
| Mt Muse | FM880 | 1 | 1 | 100.0 |
| Mt Sapeu | FM880 | 1 | 1 | 100.0 |
| Naween | FM880 | 4 | 4 | 100.0 |
| Vanimo | FM880 | 1 | 1 | 100.0 |
| Wewak | FM880 | 2 | 2 | 100.0 |
| Wewak | SR10 | 1 | 1 | 100.0 |
| District Total | | 17 | 16 | |
| PNG TOTAL | | 663 | 515 | |

Note: RSS, FM880, SR10 are single channel radio system.
TR4E1, TR3E1 are 4 CH and 3 CH radio systems, and are commonly
used not only for telephone but also telegram.

Four Rural Model Areas



8-2. ROAD SECTOR

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ROAD SECTOR

I. PROFILE OF ROAD SUB-SECTOR

1. Present State of Road Network

The present state of road network of Papua New Guinea is limited to relatively densely populated regions and to areas with a high economic potential. One of the reasons is that the marine transport has historically played significant role due to its archipelagic country, and another is that people depend comparatively on the air-transportation in the areas where there exist some problems on the geographical configuration such as steep mountains, swampy areas and rivers.

The road network consists of several regional sub-networks that serve areas with population concentrations not connected each other. The only connection is between the Highlands and Lae. It extends to parts of Morobe and Madang Provinces. The other sub-networks consists of some road sections originating in the provincial capitals: Port Moresby, Popondetta, Wewak, Varimo, Rabaul, Kimbe, and Kiata. Table 1 sets out the road network in Papua New Guinea (1986).

Some parts of Papua New Guinea already have better infrastructure and facilities than most developing countries whereas many areas have hardly any contact with the modern World. Figures 1 and 2 give a good idea of this diversity. Lae, the second largest city of PNG, is rather connected with its hinterland but several provinces have only short road sections for local use. Even Port Moresby, the Capital City, is rather isolated.

2. Road Construction

Planned road construction to 1990 by the National Government is budgeted to run at around K25 million a year, with actual expenditures varying according to implementation capacity. The cost of road construction is

generally high both because of the difficult terrain consisting of swamps, mountains and unstable ground.

Improvement of the road system in the country has been achieved with financial assistance from external agencies as well as with the National Government's own resources.

3. Future Development of Road Network

On the national road network, the typical number of vehicles per day is less than 500 vehicles, while on roads near Port Moresby and Lae the figures exceed 500 vehicles per day. For the future development of road network, major emphasis will be placed on those roads which carry significant levels of traffic and which serve areas with high development potential such as a linkage between Port Moresby and Lae.

II. TECHNICAL FEASIBILITY STUDY ON TRANS-ISLAND HIGHWAY IN PAPUA NEW GUINEA - TERMS OF REFERENCE

1. Background

Port Moresby, the capital and primary city of Papua New Guinea (a population of 130 thousand in 1980) and Lae, the second largest industrial city (a population of 120 thousand in 1980), are located at the southern and the northern sides respectively of the Owen Stanley Range running from the northwest to the southeast of Main New Guinea Island. These two cities are blocked out each other by this steep mountain and there is no land transport linkage between both cities yet.

Since the independence of the Papua New Guinea, there has been a plan to develop a trans-island highway connecting with both cities crossing over the mountain. A great number of advocates have supported this plan in which the highway is expected to facilitate the economic development as well as contribute to unionizing the nation, while it is a fact that there has been an opposite idea that such a huge amount of construction investment greatly exceeding the expected benefit will result in a danger of financial crisis.

In 1979, the Government of Papua New Guinea commenced a study on 9 alternative routes for the Trans-Island Highway between Port Moresby and Lae (refer to Fig. 2):

1. Bereina/Malalaua/Menyamya/Kainantu
2. Bereina/Menyamya/Aseki/Bulolo/Lae
3. Bereina/Kanabea/Kaintiba/Aseki/Bulolo/Lae
4. Malalaua/Kaintiba/Aseki/Bulolo/Lae
5. Popo/Bulldog/Eloa Valley/Wau/Bulolo/Lae
6. Popo/Korpera Valley/Wau/Bulolo/Lae
7. Bereina/Beipa/Akufa/Bulldog/Eloa Valley/Wau/Bulolo/Lae
8. Beipa/Akufa/Korpera Valley/Wau/Bulolo/Lae
9. Aropokina/Tapini/Garaina/Wau/Lae.

As a result of the study, out of the above nine alternatives, the fourth route, Malalaua-Kaintiba-Aseki-Bulolo-Lae, was recommended as the most optimal plan, and has been approved by the Government in 1980. This route has a total length of 575 km. The construction cost was estimated to be 62 million Kina at 1980 price (87 million US\$), and the construction cost of the feeder roads, 4 million Kina.

As of 1988, in the whole route between Port Moresby and Lae, the segment between Port Moresby and Bereina, called the Hiritano Highway, is open to public. The detailed design of the segment between Bereina and Malalaua is now being undertaken by the Japan International Cooperation Agency (JICA). The segments between Lae, Bulolo and Slate Cleek and Aseki have been completed in construction and open to public at present.

2. Study Area

The technical feasibility study shall be undertaken in the area covering the relevant areas alongside the Trans-Island Highway with about a 135 km length running from Malalaua in the Gulf Province, to Aseki in the Morobe Province through Kaintiba.

3. Objectives

- 1) Data collection for cost estimates;
- 2) Analysis on the project cost data and submission of a report of recommendations;
- 3) Determination of the route alignment;
- 4) Execution of engineering, geological and geographical surveys for the determined route, placing the benchmarks along the route in the project area, and undertaking the preliminary design.

4. Scope of Work

This study aims at identifying the appropriate route alignment and estimating the project cost of the highway between Malalaua and Aseki running in the steepest mountainous areas crossing over the Owen Stanley Range, based on the pre-feasibility study on the Trans-Island Highway between Port Moresby and Lae conducted by the Rendel and Partners in 1980. This study involves the following survey items:

4.1 The First Phase Study (for 10 months after commencement of the study)

4.1.1 Preparatory Work in Japan

Including preparation of the inception report, preparatory work shall be done in Japan.

4.1.2 Field Surveys

Technical Survey

- 1) Based on the existing topographical maps with scale 1 to 100,000, alternative plans shall be studied. After that, based on geological surveys in the areas along the alternative routes and on discussions with the Government of Papua New Guinea, the survey boundary for aerial photographing shall be determined with a purpose of making basic geographical maps with scale 1 to 10,000.
- 2) A number of locations of control point and photo signal for aerial photographing shall be selected and placed, and a location observation shall be taken based on GPS¹.
- 3) Aerial photography shall be executed with confirmation of the films. Supplemental land surveys shall be carried out as well.

1 GPS: Global Positioning System by means of satellites developed by NASA.

- 4) Field surveys of the existing road network in the project area shall be carried out.
- 5) Material surveys and road traffic access surveys shall be carried out in order to get useful information for the construction planning.

The above study results will be arranged in the progress report for discussions which will be submitted within four months after commencement of the study.

4.1.3 Mapping Work in Japan

- 1) Aerial triangulation
- 2) Mapping work of topographical maps with scale 1 to 10,000.

4.1.4 Design Work of Alternative Routes

- 1) Based on the plotted topographical maps with scale 1 to 10,000, alternative plans shall be examined, thereby providing a basis for selection of the optimal route.
- 2) With carrying out cost surveys on construction materials and machinery, a comparative study shall be undertaken in terms of construction costs and maintenance costs among the alternative routes.

The interim report will summarize the above study results regarding the assessment of the optimal route and be submitted within 9 months after commencement of the study. At the same time, a number of recommendations to lead this project to being successful will be presented to the Government of Papua New Guinea.

4.2 The Second Phase Study

4.2.1 Mapping Work in Japan

The topographical maps of the areas, where the route determined under an agreement of the Government of Papua New Guinea is to run, shall be produced with scale 1 to 2,000, by using the aerial photo films.

4.2.2 Preliminary Highway Design

The preliminary design of the route between Malalaua and Aseki shall be laid out on the plotted topographical maps with scale 1 to 2,000 with specifications of the center line of the right of way, the alignment, the necessary structures such as bridges and tunnels, if required. This work will be done both in the local office and Japan.

4.2.3 Geological Survey

A series of geological surveys shall be taken in order to obtain the information necessary for a construction planning in terms of basement of the main structures, quarry sites of sand, soil and stones for banks and aggregate, and locations of soft ground.

4.2.4 Construction Planning and Estimation of Construction and Maintenance Costs

Out of several alternative construction schemes, the one that minimizes the time of construction and the costs for maintenance will be selected and further examined.

Table 1 The Road Network in PNG - 1986

| Province | (unit: km) | | | | Total |
|-------------------------|------------------------------|----------|------------------|----------|--------|
| | National Roads ¹⁾ | | Provincial Roads | | |
| | Sealed | Unsealed | Sealed | Unsealed | |
| Western | - | 81 | 4 | 409 | 494 |
| Gulf | - | 18 | 3 | 270 | 291 |
| Central (Including NCD) | 266 | 542 | - | 1,149 | 1,957 |
| Milne Bay | 2 | 31 | - | 299 | 332 |
| Oro | 16 | 416 | 4 | 367 | 803 |
| Southern Highlands | 31 | 217 | - | 1,238 | 1,486 |
| Enga | - | 91 | 3 | 750 | 844 |
| Western Highlands | 54 | 110 | 10 | 1,016 | 1,190 |
| Simbu | 60 | 40 | 4 | 660 | 764 |
| Eastern Highlands | 125 | 64 | 15 | 1,265 | 1,469 |
| Morobe | 169 | 172 | 22 | 949 | 1,310 |
| Madang | 31 | 340 | 25 | 584 | 980 |
| East Sepik | 6 | 189 | 22 | 873 | 1,090 |
| West Sepik | - | 142 | 3 | 486 | 631 |
| Manus | - | - | 2 | 149 | 151 |
| New Ireland | - | - | 9 | 1,400 | 1,409 |
| East New Britain | 26 | 58 | 116 | 1,000 | 1,200 |
| West New Britain | 24 | 361 | 9 | 538 | 932 |
| North Solomon | - | - | 60 | 1,155 | 1,215 |
| | 808 | 2,872 | 311 | 14,557 | 18,548 |

Note 1: National roads include oil palm roads in Oro and West New Britain Provinces, Port Moresby urban roads and some "temporary" National roads in addition to the National Highway.

Source: 1979 National Road Inventory, selected reports and Provincial Inventories, Department of Works estimates.
Collated by Policy and Planning Division, Department of Transport.

Figure 1 Allocation of Major Transport Facilities

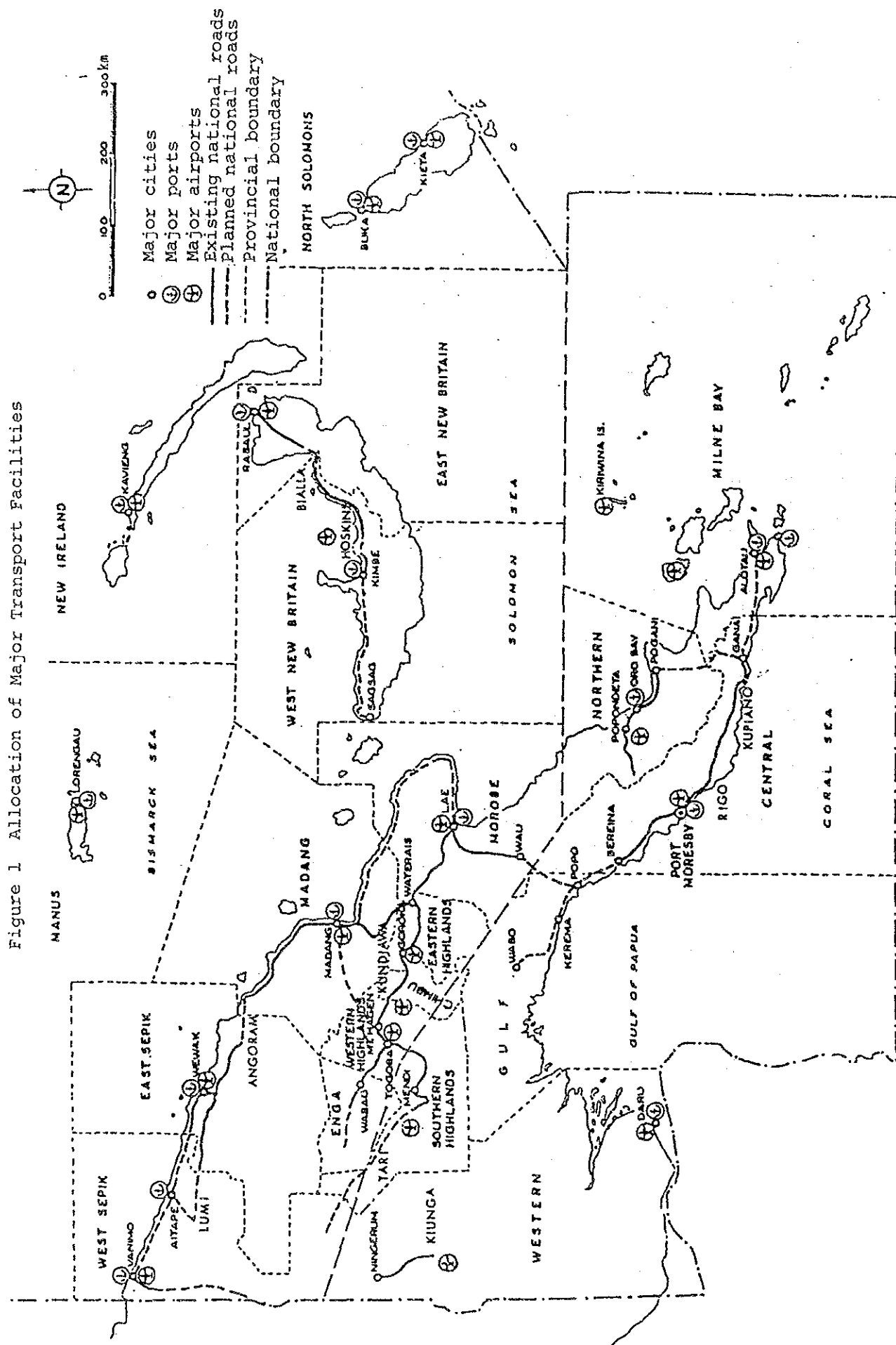
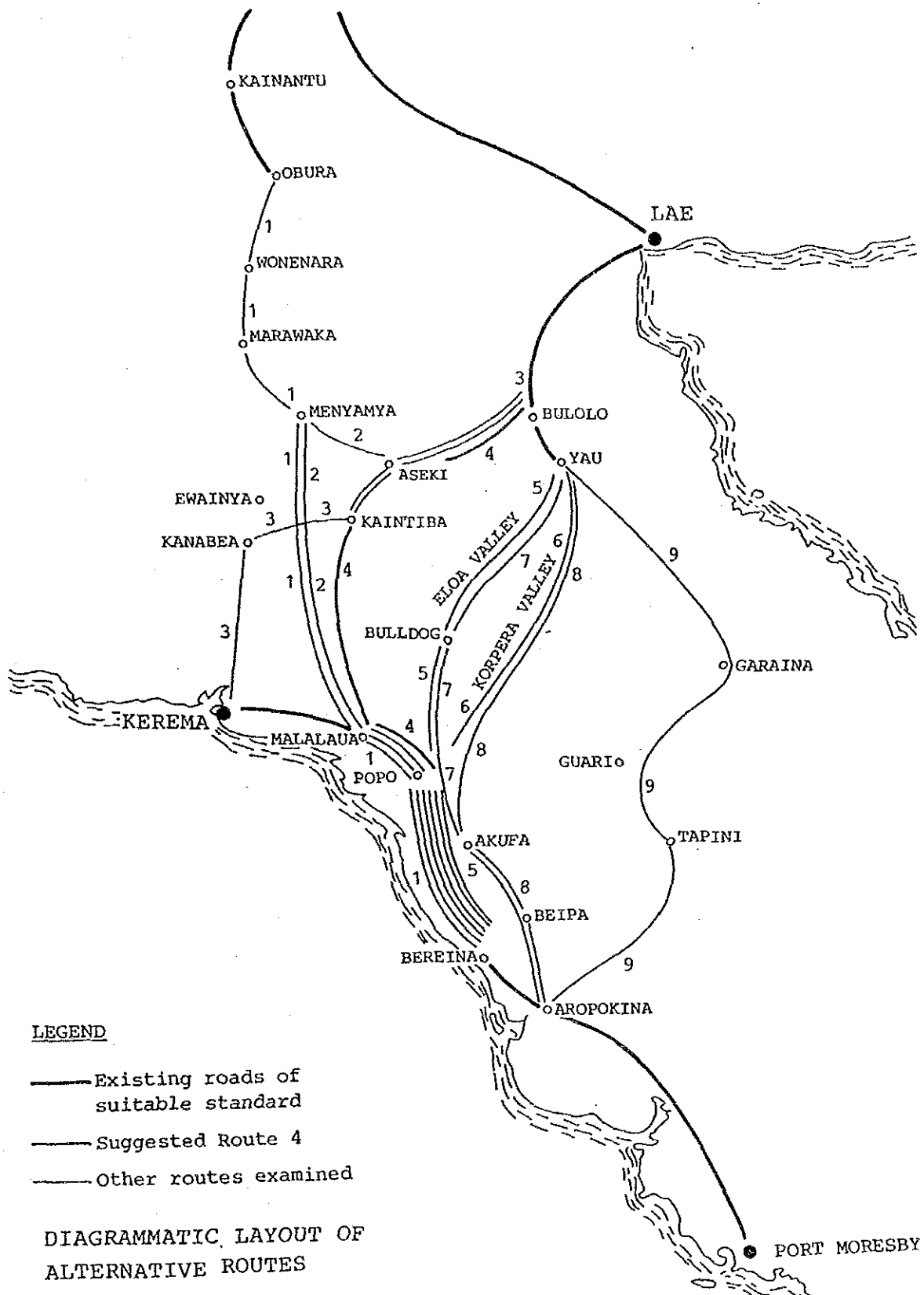


Figure 2 Trans-Island Road (Pre-feasibility Study)



8-3. FISHERY SECTOR

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FISHERY SECTOR

I. DEVELOPMENT OF THE COASTAL FISHERIES

PNG is endowed with abundant marine fishery resource and has a high development potential. Fish is an important source of protein for the population in the coastal area. However, the coastal fishery has been remained in very low level and most of the fishing activities is one of means for coastal villagers livelihood.

With rapid increase of population in urban area, the demands for foodstuff are on the increase. Import of fishery products has been growing larger, accordingly, so as to supplement the shortage of local fish supply. Recently, total weight of the fishery products imported has exceeded thirty thousand ton a year.

Under these circumstances, the Government has made efforts to promote the coastal fisheries with the purposes below:

- 1) To increase cash earning opportunities for coastal villagers, most of whom have few other cash earning possibilities than fishing and to raise their living standard.
- 2) To increase fish supply for the population.
- 3) To reduce the imports of fishery products by increasing domestic fish supply.

1. Constraint to the Development

(1) Low accessibility to markets

People being engaged in the fishery live in very small villages scattered in large coastal and estuary areas. Most of the villages are in distance from local commercial centers and urban areas and have no access to

markets due to lack of road infrastructure. Therefore, with the exception of few cases, village fishermen have no chance to sell their catches. Consequently, their fishing activities have been performed for subsistence needs for the family and members of the village community.

(2) Lack of motivation to fishing

There are less motivation to fishing among the coastal fishermen. Most of the village fishermen and their families are also engaged in gardening (small scale subsistence agriculture). They do not depend on fishing alone for their livelihood. There are some other factors seemed to affect the motivation, in a negative way. For example, it is very important and consequently that working on the land to grow food is a very important productive activity. Financial returns from fishing might not be as high as desirable. In most cases, it might not be worth all the troubles and risks to engage in fishing.

(3) Traditional fishing rights

As same like land ownership, there are traditional fishing rights as claimed by villages, by clans and by individual fishermen. The traditional rights have a considerable influence on development of the fishing.

Though these rights often do not appear until somebody inquires about them previously unclaimed area may suddenly come under dispute as a result of an increase in fishing pressure.

(4) Competition with imported fishery products

As mentioned above, large amount of fishery products has been imported. Most of the imported products are canned fish. Because of their comparatively cheap price and convenience for storage, canned fish are distributed even in in-land towns as well as urban areas.

2. Development Projects and Experiments

PNG National and the provincial government have implemented many projects and experiments to promote the coastal fisheries. The major experiments are as follows:

(1) Coastal Fisheries Development Project, 1979

The National Government, Department of Primary Industries (DPI) implemented a nation wide project "Coastal Fisheries Development Project" in 1979. This project was to aim in arranging a cold-chain marketing system connecting large cities in the country by establishing fishing stations with cold storage and other refrigerating facilities in coastal areas and introducing refrigerating boats for sea transportation of frozen fish. This system was prepared to overcome the major constraint to the development potential "low accessibility to markets".

The fishing stations were establish in Baimuru, Samarai, Kinbe, Tufi, Kupiano, Misima and Manus by 1983. With the cooperation extended by New Zealand, a refrigerating boats was also introduced for frozen fish transportation.

The system, however, had not functioned as what initially aimed due to high operation costs. The system and facilities introduced were too large and sophisticated to manage. It was also affected by insufficient technical support and inappropriate marketing study.

Eventually, the project was failed and many fishing stations were compelled to stop or minimize their operations.

(2) Artisanal Fisheries Project, 1984 with IFAD's cooperation

With cooperation of International Fund for Agriculture Development (IFAD), the National Government studied new development project in collaboration with the Gulf Province Government and the Milne Bay

Province Government. The study concluded a project to reform and strengthen the fishing station in Baimuru (Gulf Province) and Samarai (Milne Bay).

Acquiring IFAD's technical and financial cooperation, the project was executed in 1984. The two fishing stations were reformed to subsidiary fishery company of the National and each provincial government "Baimuru Fisheries Company" (BDC) and "Milne Bay Fishing Authority" (MBFA).

They are currently purchasing fish from village fishermen in the regions and producing fishery products for local markets and for export. However, they also seem to suffer from high operation cost and need continuous subsidy from the National/the provincial government for maintain their operation.

3. Foreign Aid

(1) Aid from international organizations

As mentioned above, IFAD has funded for the "Artisanal Fisheries project" since 1984 for five years. By the finance, the facilities of Baimuru Fishery Company and Milne Bay Fishing Authority were strengthened and a consultants team was engaged in the project to assist the DPI, Fisheries Division in Port Moresby.

Asian Development Bank was financed a salt fish project in the Sepik.

(2) Bilateral aid

Australia and New Zealand are active in supporting village fishermen with gear, outboard engines and financial assistance. In the "Coastal Fisheries Development Project, 1987", New Zealand supported the fishery station in Kimbe, introducing refrigeration boats for frozen fish transportation.

The United States, England, Australia, Canada and Japan are fielding volunteers to work in area of extension service, gear development, statistics and administrative supports.

(3) Assistance from religious groups

Missions from different churches and religious groups are providing assistance to local communities mainly with boat building and fish preservation.

II. NEW PLAN ON COASTAL FISHERIES DEVELOPMENT

The past development experiments of coastal fisheries have concentrated on freezing local catches for subsequent distribution to urban areas and other centers of demand. Through the experiments the Government has recognized that fishery stations with cold storages and other refrigerating facilities are commercially non-viable, providing only minimal benefit to coastal communities. This is because:

- 1) The catches of the coastal fishery are insufficient to support necessary infrastructural and marketing costs. In other words, marketing facilities introduced are too large and their operation costs are too high to cover by the catches.
- 2) Man power and supporting technique are limited to manage and operate sophisticated marketing facilities and system in nation wide.
- 3) Domestic markets for frozen fish are small and consumption expenditure is directed towards cheap imported fishery products or locally caught iced fish.

1. Outline of the Program

Based on the recognitions, DPI of the National Government formulated a new development program "Local Coastal Fisheries Self-sufficient Program (LCFSP)" in the Mid-term Development Plan (1986-1990). The new program has the following basic strategies.

- 1) Fish caught is to be consumed within the area where the fish is landed.
- 2) Through appropriate technical and financial supports, full-time fishermen are to be promoted.

- 3) Fish caught is to be collected from the coastal fishermen in a projected area and be sent to the markets in the same region with ice for fish preservation.
- 4) Marketing system including fish collecting system is to be simple one and be of self cost-recovery.

The program will focus initially on meeting local fish demands of the most populated urban areas and adjoining rural coastal and inland areas. The projected areas will be Port Moresby, Lae, Madan, Wewak, Rabaul and Arawa. These cities have a combined population of 324,000 in 1985, rising to more than 400,000 by 1990. Under the instruction and support of the National DPI, each provincial government DPI will formulate education system with extension service and technical supports based on the regional circumstances to encourage village fishermen to fish more intensively and promote full-time fishermen in the projected area. Six hundred full-time fishermen in total will be promoted in the program.

Marketing system of iced fish will be established in each projected area with the minimum facilities and investment. The program also aims to supply iced fish for Mount Hagen and Goroka from Madan and Lae.

2. Development Survey

In order to materialize the program, there is a number of issues to be studied and be solved such as education and enlightening of fishermen, technical support and extension services, study of marketing situation and marketing system and facilities to be introduced, etc. The government, therefore, need to carry out a study to reconsider their development policy, identify requirements and profile viable projects for implementation of the program.

It is essential for the "Local coastal Fisheries Self-sufficient Program" to establish simple marketing systems with self cost recovery and strengthen supporting schemes for village fishermen such as extension service, technical and financial supports. In these areas, Japan has

much experience and knowledge so that Japan can provide sufficient technical service for the study mentioned above. And it will be significant that Japan carry out the survey and give necessary recommendations for the coastal fisheries development.

III. DEVELOPMENT SURVEY FOR COASTAL FISHERIES DEVELOPMENT

- TERMS OF REFERENCE

1. Background

Village people living in the coastal and estuary areas have been traditionally engaged in some fishing activities. Most of their fishing activities are, however, no more than subsistence level with traditional methods and gears, though fish is an important source of protein for the population and there would be large potential of fishery development.

The government has intended to develop the coastal fisheries in order to increase cash earning opportunities for the village people, to increase fish supply for the population and to reduce import of fishery products.

The major constraints to the development of the sector seem to be low accessibility to markets, insufficient infrastructures, villagers traditional life style and lack of incentives to fishing.

Efforts have been made by the authorities concerned for promoting the sector without results as what initially expected. One of the major pilot programs was "the Coastal Fisheries Development Project" implemented in 1979, in which fishery stations with refrigerating facilities were established in seven sites to provide fish collecting and marketing service for the fishermen. However, they had not functioned properly, suffered from high operation costs and eventually most of them were compelled to stop or reduce their operations.

Through the experiments, the government have recognized that the system introduced was too large and sophisticated to manage and refrigeration facility alone does not encourage the coastal fishery development.

In the government's Medium-Term Development Plan (1986-1990), "Local Coastal Fisheries Self-sufficient Project" were planned by the Department of Primary Industry. This aims at supplying fish to major cities from near coastal areas, establishing fish collection/marketing system with

ice for fish preservation and promoting full-time fishermen in the areas. The projected areas are Port Moresby, Lae, Madan, Wewak and Rabaul. The plan also aims at supplying iced fish to major cities in highland, Goroka and Mt Hagen.

There are also some development plans and proposals made by provincial governments. For example, the Milne Bay Province Government has proposed to promote the development of coastal fisheries including aquaculture such as shrimp and fish farming. The development is given a high priority because the province has many islands, large reef areas and continental shelves.

The Gulf Province Government has a plan for construction of a harbour and fishery complex in Kerema, the capital city of the province. The plan aims at supplying fish for domestic markets and developing shrimp culture and crocodile farming by utilizing by-catch of shrimp trawling off the province, which are currently thrown away at sea. It is also to promote the development of coastal fishery by providing cash earning opportunities for village fishermen through the operation of the fishery complex.

These plans also have difficulties in marketing of fish/products and a lot of unknown factors in aquaculture, which must be studied throughout.

The Fishery Division was promoted to an new independent department "Department of Fisheries and Marine Resources" from one division of DPI in March 1987. At this time, the authority needs to carry out a comprehensive study of the coastal fisheries including the aforementioned plans made by the national/provincial governments and formulate a master plan for the coastal fishery development from a long term view.

2. Objective

The objective of the development survey is as follows.

To study development potentials including the plans and proposals made by the national/provincial governments mentioned in the above section "Background". Since low accessibility to markets is the hardest constraint to the development, the study is to be mainly focused on the improvement of the marketing aspects.

And to formulate a master plan for the coastal fisheries development from a long term view, based on the said study.

3. Objective Areas of Survey

The survey areas are those which are involved in the aforementioned plans/proposals, that is, Port Moresby, Lae, Madan, Wewak, Rabaul, Mt Hagen, Goroka and their surrounding areas and Milne Bay Province, Gulf Province.

4. Scope of Work

4.1 Master Plan

Through field visits, available reports and dialogues with both public and private sector, a comprehensive study on the coastal fisheries in the said areas is to be carried out to identify the real situation and problems/constraints to the development.

Based on the study, the development potential is examined for each component; i) improvement of the marketing from catching to consumption, ii) improvement of fishery including education for fishermen and supporting facilities, iii) introduction of aquaculture. And a master plan for the coastal fisheries development is formulated, including development strategy and sub-projects in selected areas.

The survey and study will include the following items;

(1) General situation

- 1) The provincial governments' policy for the coastal fishery development and activities concerned.
- 2) Socioeconomic conditions in each area

(2) Fishing and marketing

- 1) Population of fishermen and their distribution in each area.
- 2) Fishing method, gears, fishing boats, fish production, fishing and other productive activity of village fishermen.
- 3) Existing infrastructure and facilities for fishing and marketing.
- 4) Fish demands and supply (fish locally caught and imported fishery products) in each area.
- 5) Existing fish marketing channels and price structure.
- 6) Market facilities and equipment.
- 7) Situation of transportation between fish landing points and fish demand centers.
- 8) Natural and social conditions in each area from a view point of shrimp and/or fish aquaculture.

(3) Fishery supporting system

- 1) Existing technical extension service, technical and financial support system for fishermen and their management

- 2) Fishermen's needs and requirements for the supporting services.

4.2 Sub-project Profile

Sub-projects, which are given high priority as a result of the study, are to be profiled in the master plan.

5. Composition of Survey Team

The survey team will consist of experts in fishery development planning cum economics, fish marketing, fisheries and aquaculture.

6. Reporting Requirement

The study team will prepare and submit the following reports to the PNG Government.

(1) Inception report

The report will include survey items and study methods.

(2) Progress report

The report will include the analysis of the coastal fisheries with problems and constraints.

(3) Interim report

The report will describe the assessment of development potential and a draft of the master plan including development strategy in each area.

(4) Draft final report

The report will describe the master plan including sub-projects.

(5) Final report

The report will be completed after necessary corrections if any.

Table 1 - (a) Import of Fishery Products

| Products | 1984 | | 1985 | | 1986 | |
|--|--|--|--|--|--|--|
| | Quantity (Ton) | Value (1,000K) | Quantity (Ton) | Value (1,000K) | Quantity (Ton) | Value (1,000K) |
| Canned Fish (Mackerel) (Sardines) (Herring) (Tuna) (Others) | 27,308 (23,560) (2,096) (561) (231) (860) | 21,273 (18,504) (1,683) (616) (249) (221) | 28,426 (24,215) (2,981) (449) (146) (634) | 23,390 (20,385) (2,053) (496) (185) (671) | 33,399 (27,771) (3,870) (780) (109) (867) | 33,910 (27,884) (4,133) (843) (185) (865) |
| Fish and Others (Frozen & Chilled) | 1,839 | 1,617 | 1,507 | 1,188 | 1,195 | 1,334 |
| Processed Fish and Other | 15 | 880 | 398 | 210 | 6 | 14 |
| Others | - | - | 534 | 887 | 64 | 276 |
| Total (a) | 29,162 | 24,102 | 30,865 | 26,075 | 34,664 | 35,534 |
| Grand Total Value of PNG Import (A) | | 852,137 | | 841,425 | | 902,069 |
| a/A x 100 (%) | | 2.8 | | 3.1 | | 3.9 |

Source : National Statistical Office

Table 1 - (b) Export of Fishery Products

| Commodity | 1984 | | 1985 | | 1986 | | 1987 | |
|--|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|-------------------|
| | Quantity (Ton) | Value (1,000K) | Quantity (Ton) | Value (1,000K) | Quantity (Ton) | Value (1,000K) | Quantity (Ton) | Value (1,000K) |
| Skipjack (Frozen, Round) | 2,521 | 1,347 | 8,436 | 4,092 | 0 | 0 | 0 | 0 |
| Barramundi (Frozen, Fillet) | 7 | 41 | 82 | 373 | 69 | 352 | 69 | 390 |
| Barramundi (Frozen, Round) | 51 | 239 | 0 | 0 | 11 | 69 | 4 | 22 |
| Other Fish (Frozen) | 102 | 75 | 13 | 28 | 118 | 104 | 168 | 61 |
| Shrimp (Frozen) | 1,101 | 6,439 | 1,391 | 9,046 | 1,416 | 9,267 | 1,067 | 8,482 |
| Lobster (Frozen) | 49 | 615 | 56 | 736 | 55 | 742 | 66 | 921 |
| Other Crustaceans (Frozen) | - | - | 2 | 4 | - | - | 17 | 177 |
| Molluscs | 1 | 2 | 20 | 73 | 90 | 269 | 7 | 46 |
| Others | 64 | 75 | 5 | 90 | 112 | 487 | 125 | 267 |
| Total (a) | 3,897 | 8,835 | 10,005 | 14,443 | 1,869 | 11,290 | 1,524 | 10,431 |
| Grand Total Value of PNG Export (A) | | 805,540 | | 910,203 | | 1,013,776 | | 935,602 |
| a/A x 100 (%) | | 1.1 | | 1.6 | | 1.1 | | 1.1 |

Source : National Statistical Office

- * Quantity and Value in 1987 are those of 11 months ending November, 1987.
 * Skipjack (Frozen, Round) was produced by foreign fishing boats with Fishing agreement.

Table 2 The Coastal Population of Papua New Guinea

| PROVINCE | (1) | (2) | (3) | (4) | (5) | (6) |
|-------------------|---------|-------|-----|------|---------|-----|
| P01 Western | 11,347 | 71 | 160 | 14.4 | 7,127 | 39 |
| P02 Gulf | 19,079 | 106 | 180 | 29.8 | 4,797 | 20 |
| P03 Central | 32,612 | 99 | 328 | 27.9 | 1,531 | 4 |
| P04 N.C.D | | | | | 123,647 | 100 |
| P05 Milne Bay | 80,723 | 305 | 265 | 63.1 | 5,747 | 7 |
| P06 Northern | 8,887 | 80 | 111 | 11.5 | 0 | 0 |
| P12 Morobe | 20,723 | 92 | 225 | 6.7 | 61,617 | 75 |
| P13 Madang | 21,984 | 118 | 186 | 10.4 | 22,590 | 51 |
| P14 East Sepik | 13,174 | 66 | 200 | 5.9 | 19,890 | 60 |
| P15 West Sepik | 14,003 | 49 | 286 | 12.3 | 6,439 | 32 |
| P16 Manus | 13,946 | 99 | 141 | 53.6 | 3,986 | 22 |
| P17 New Ireland | 50,677 | 388 | 131 | 77.1 | 5,386 | 10 |
| P18 East N. Brit. | 36,142 | 155 | 233 | 27.1 | 17,121 | 32 |
| P19 West N. Brit. | 38,420 | 204 | 188 | 43.2 | 4,662 | 11 |
| P20 N. Solomons | 29,575 | 128 | 231 | 23.0 | 18,517 | 39 |
| TOTALS | 391,292 | 1,944 | | | 303,034 | |
| AVERAGES | | | 201 | 13.0 | | 44 |

- (1) Coastal Population.
(2) Number of coastal villages.
(3) Average number of persons per village.
(4) Percentage coastal population of total population.
(5) Urban coastal population.
(6) Percentage coastal urban population of total coastal population.

Sources: 1980 Census.
Frielink, 1983b.

Table 3 An Estimate of the Coastal Fisheries Potential
for P.N.G. Provinces

| PROVINCE/AREA | SHELF AREA LESS THAN 200m DEEP x 1,000ha 1) | REEF AREA LESS THAN 30m DEEP x 1,000ha 2) | POTENTIAL YIELD (METRIC TONNES) ===== | REEF AREA SHELF AREA 3) | 4) | 5) |
|------------------|---|---|--|-------------------------------|----|---------|
| TORRES STRAIT | 3,378 | 1,042 | 20,840 | 27,000 | | 67,660 |
| WESTERN/GULF | 4,578 | -- | | 36,000 | | 91,500 |
| CENTRAL | 582 | 187 | 3,740 | 4,660 | | 23,300 |
| MILNE BAY | 4,115 | 1,287 | 25,740 | 32,900 | | 83,300 |
| NORTHERN | 1,652 | 517 | 10,340 | 13,300 | | 33,240 |
| MOROBE | 246 | 77 | 1,540 | 1,970 | | 7,390 |
| MADANG | 89 | 29 | 520 | 710 | | 2,670 |
| EAST SEPIK | 63 | 21 | 420 | 510 | | 1,900 |
| WEST SEPIK | 61 | 20 | 400 | 410 | | 1,540 |
| MANUS | 737 | 230 | 4,600 | 5,900 | | 22,100 |
| NEW IRELAND | 446 | 139 | 2,780 | 3,570 | | 13,400 |
| EAST NEW BRITAIN | 216 | 68 | 1,360 | 1,730 | | 6,490 |
| WEST NEW BRITAIN | 439 | 137 | 2,740 | 3,510 | | 13,200 |
| NORTH SOLOMONS | 768 | 240 | 4,800 | 6,140 | | 23,000 |
| TOTAL | 17,370 | 4,000 | 79,820 | 138,690 | | 390,690 |

1) MUNRO, J., (1976)

2) WRIGHT, A. & A.H. RICHARDS (1983).

3) assuming 20 kg/ha.year.

4) MUNRO, J., 1976, moderate exploitation, assuming 8 kg/ha.year.

5) MUNRO, J., 1976, heavy exploitation, assuming 22 kg/ha.year.

Table 4 Fishereis Development Indicators per Province*

| COASTAL POPULATION LIVING IN VILLAGES 1980 | LENGTH OF COASTLINE IN KILOMETERS (EST. CPI) | NUMBER OF PERSONS PER KILOMETER OF COASTLINE | ESTIMATED PEEF-FISHERIES POTENTIAL METRIC TONNES PER YEAR | LANDINGS AT FISHERIES CENTRES METRIC TONNES 1982 | PROJECTED PROV. BUDGET ALLOCATION FISHERIES 1982, KINA | NUMBER OF PEOPLE EMPLOYED IN FISHERIES IN THE PROV. 1983 | FREEZER HOLDING CAPACITY KILOGRAMS |
|--|---|---|---|--|--|--|---|
| Western | 1,150 | 10 | | 272 | 32,200 | | 18,000 |
| Gulf | 18,217 | 28 | | 72 | 13,000 | 5 | 10,000 |
| Central | 31,281 | 52 | 3,740 | 19 | 73,000 | 10 | 5,000 |
| Milne Bay | 86,313 | 41 | 25,740 | 90 | 33,150 | 12 | 41,000 |
| Northern | 9,363 | 29 | 10,340 | 46 | 20,700 | 29 | 11,300 |
| Norobe | 20,683 | 31 | 1,540 | 23 | 13,000 | 9 | 0 |
| Madang | 22,228 | 53 | 520 | 13 | 4,000 | 8 | 5,200 |
| East Sepik | 14,180 | 48 | 420 | 18 | 10,565 | 9 | 20,000 |
| West Sepik | 14,198 | 55 | 400 | 6 | 19,000 | 12 | 1,000 |
| Manus | 14,098 | 34 | 4,600 | - | 60,000 | 20 | 22,000 |
| New Ireland | 50,677 | 38 | 2,780 | 53 | 87,000 | 9 | 5,600 |
| East N Britain | 38,391 | 54 | 1,360 | 9 | 73,966 | 13 | 5,000 |
| West N Britain | 40,974 | 47 | 2,740 | 49 | 43,200 | 15 | 2,400 |
| North Solomons | 31,855 | 46 | 4,800 | 17 | ? | 15 | 19,000 |
| Totals | 403,805 | 10,381 | 59,980 | 687 | 481,761 | 166 | 165,500 |
| Averages | | 39 | | | | | |

* Figures are mainly representative of government-owned assets only.
Few private assets exist.

Table 5 Some Indicators Concerning the Economic Position
of Coastal Provinces

| | Domestic Factor Incomes (A) | Non-market Component Operating (B) | Productive Output per Capita (C) | Percentage of Output in Agriculture (D) |
|------------------|--------------------------------------|---|---|--|
| Western | 191 | 78.9 | 2.6 | 37.1 |
| Gulf | 193 | 79.7 | 15.7 | 51.6 |
| Central | 266\$\$ | 69.3\$\$ | 167.9## | 9.2## |
| Milne Bay | 219 | 69.7 | 15.0 | 83.1 |
| Northern | 273 | 63.2 | 33.0 | 60.6 |
| Morobe | 578 | 26.6 | 168.9 | 11.2 |
| Madang | 305 | 51.2 | 74.1 | 40.8 |
| East Sepik | 244 | 60.0 | 26.0 | 68.0 |
| West Sepik | 188 | 82.1 | 8.7 | 81.0 |
| Manus | 313 | 55.3 | 32.3 | 55.3 |
| New Ireland | 442 | 38.5 | 109.0 | 94.4 |
| East New Britain | 829 | 19.6 | 178.1 | 57.9 |
| West New Britain | 407 | 44.1 | 172.8 | 56.5 |
| North Solomons | 2,248 | 6.0 | 274.8 | 41.8 |
| Highlands region | 264 | 45.0 | 66.7 | 74.8 |
| Papua New Guinea | 504 | 31.9 | 94.5 | 45.7 |

\$\$= excluding the National Capital District.

##= including the National Capital District.

(A): Average domestic factor incomes per person in 1980, in Kina.

(B): Operating surplus: non-market component as percentage of the total operating surplus, 1980.

(C): Productive marketed output per capita, in Kina.

(D): Percentage of (C) produced in the agricultural sector.

Sources: (A)+(B): National Statistical Office, National Accounts Statistics, Bulletin no. 12, December 1981.

(C)+(D): D. Jackson, Income distribution in Papua New Guinea, Port Moresby, 1981.

8-4. AGRICULTURE SECTOR

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AGRICULTURE SECTOR

I. PRESENT SITUATION OF THE AGRICULTURAL SECTOR

The agricultural sector in Papua New Guinea is presently sharing about one third of GDP and 30 percent of total export earnings. It is estimated that about 80 percent of the country's total population is engaged in agricultural activities. In general, the country is exporting coffee, cocoa, palm oil, coconut oil, and timber, and in turn importing foodstuff such as rice meat, and fish. The structure of exports and imports in 1982-83 was as follows:

| | In Million Kina | Percentage in Total Export | Percentage in Food Import |
|---------------------|--------------------|-------------------------------|------------------------------|
| Total export | 678 | 100 | |
| Agricultural export | 199 | 29 | |
| Total food import | 136 | | 100 |
| Rice import | 84 | | 62 |
| Meat & fish import | 29 | | 21 |

These figures show that agricultural products shared about 30 percent of the country's total export earnings, and the total revenue that the country gained from exporting agricultural products still exceeded the total expenditure for food import. However, it should be noted that agricultural export earnings increased in the period 1975-80 but have turned to decline in the recent years as a consequence of downward trend in world market prices. On the other hand, the total expenditure for rice, meat, and fish imports has continued to increase from 1980, reflecting upward trend in the domestic consumption of these products.

The principal export crops are coffee, cocoa, coconut, oil palm, and natural rubber, and in most parts of the countries farmers cultivate banana, taro, and sweet potato for domestic consumption. Rice

cultivation is also found in a number of provinces. In general traditional cropping methods are adopted for both export and subsistence crops, and thus the yield is substantially low as compared with the international level. With respect to livestock, middle-scale poultry production, generally by non-indigenous people, can be seen in some suburban areas.

II. AGRICULTURAL DEVELOPMENT PLANNING

The government of Papua New Guinea has not prepared development plans for the agricultural sector. However, the policy framework for public investments in this sector can be found in the government's medium-term budget strategy and investment programs (see Planning and Budget Strategy 1988-92, and Public Investment Programme 1988-92). The objectives of the programs for the agricultural sector were set as follows:

- 1) Promotion of commercial/plantation investment;
- 2) Allocation of public resources to economically viable activities for import substitution and import promotion;
- 3) Improvements of national extension, planning, training, and research to strengthen supports to provincial divisions;
- 4) Development of renewable agricultural and livestock resources within the limits of sustainable yields; and
- 5) Utilization of forestry land for agricultural and livestock production.

III. PRESENT SITUATION OF THE RICE SUBSECTOR

1. Production, Consumption and Imports

Although rice growing has a rather long history in Papua New Guinea, the production level has been low and shown tendency to decline in the last ten years. The domestic consumption of rice, however, has expanded at a high rate as a result of low imported rice price and increase of incomes from cash crop exports. These trends in production and consumption have led to a remarkable increase in rice imports and created increasing burden to the country's trade balance.

As rice growing in Papua New Guinea is mostly for farmhousehold's consumption and most of rice fields are located in remote areas, there are no reliable data on actual production. However, it is roughly estimated that the domestic production has declined from its maximum level of over 2,000 tonnes to insignificant quantities in recent years. On the other hand, rice consumption (apparent consumption) went up from 73,000 tonnes in 1977 to an estimate of 115,000 tonnes in 1983 with an average annual growth rate of 7% (Table 1). An FAO mission's paper reported that rice consumption in Papua New Guinea was projected to increase to 120,000 - 150,000 tonnes in 1990, and 160,000 - 200,000 tonnes in 1995 ¹⁾.

2. Historical and Regional Aspects

The history of rice cultivation in Papua New Guinea rooted back to the Pre-First-World War years with the German Administration promoting rice production to reduce imports and Filipino Catechists producing rice feed themselves during the dry season. In these years rice was cultivated mainly in Mekeo. In the Inter-War Period, rice cultivation was encouraged in the Mekeo Plains and the Gulf. Some extension activities were also undertaken in the New Guinea prior to the Second World War.

1. FAO, Rice Development Policy: An Analysis of the Options for Meeting Future Rice Consumption Requirements, Papua New Guinea, March 1986.

During the Second World-War government efforts in rice were confined to the Mekeo in Papua. In New Guinea, the Japanese introduced rice growing schemes in New Ireland and New Britain.

At the beginning of the Post-War Period, the Australians took further steps to enlarge the production of rice for its advantage as a food item in terms of easy storage and transportation. As a result, a number of varieties were introduced at Epo and Bubia, and multiplied for distribution in Milne Bay, Madang, Sepik, New Britain, Bougainville, Morobe, and Gulf Provinces. In the Central Province, large scale of mechanized rice production was promoted in the Mekeo. In the period 1963-73, private and public interests in rice production were gradually losing impetus partially because of increase in imported low-price rice, and partially because of the prevailing view that domestic rice production had less comparative advantage compared with cash crops such as cocoa and coffee. From 1974, with the establishment of the self-government, the public attitude turned positive to the domestic production of rice with promotion programs for New Ireland, Mekeo, Morobe, the Sepiks, and Central Provinces. However, the production of rice tended to decline.

Although rice cultivation is informed existing in every coastal provinces and in several highland provinces, at present significant rice production is found mostly in only five provinces: East Sepik, West Sepik, Morobe, Madang, and Central. The two Sepiks and the Central are the leading rice growing provinces at present.

The major rice growing area at Morobe province are Fins-chhafen, Markham Valley, and Gabmazung. Fins-chhafen is characterized by its small-scale production of upland rice at the village level. In the Markham Valley, mechanized production of dryland was attempted in the past but has gradually faded out in recent years. At Gabmazung the Lutheran Mission has supported a flood irrigated rice farm using water from a small stream of low bicarbonate water. The national research center at Bubia has undertaken a rice breeding program under the assistance of South Korea from the mid-1970's to 1986. However there have been no follow-up activities after the departure of the last Korean breeder in 1987. The

The Province has two extension service centers run by the churches (training village motivators) and one provincial training center (training extension workers).

The rice growing in the East Sepik Province attained its peak in 1971 with the total production per annum (paddy rice) estimated at 1,730 tonnes, and has gradually declined to a small amount of 180 tonnes in 1985 (see Table 4). Maprik is the leading rice growing area of the province with an estimate of 2,000 farmers growing 900 tonnes on 690 hectares in 1971. A minor quantity of rice production is made in the Sepik swamps at Angoram. The farmers in this area are relatively enthusiastic in rice production because there are few alternatives. Rice is also planted in some remote areas of Ambunti, but the production quantity is insignificant.

The West Sepik Province's rice growing is found in the area between Seim and Nuku, Lumi, Yangkok, Green River, Amanab, and Bewani. The production at the populated area between Seim and Nuku was informed to go up to 400 tonnes per annum in 1971 but gradually declined thereafter due to poor public attention to road development and competition of coffee. In Madang Province, rice production showed rapid increase in the postwar years, partly because of suitable soils and weather and partly because of intensive efforts of the central and provincial governments. Like in other provinces, rice growing in Madang has lost its strength since the mid-1970's but it is still continued in the coastal areas by small-holders. There is a vocational center near Bau which once operated a rather successful small irrigated rice program. Rice in the Central Province is grown mainly at Mekeo; small quantities of production are also recorded at Kupiano. Rice growing in the Central Province has an advantage on its proximity to Port Moresby, the center of administration. However, recently rice production in this province has suffered from increase in low-price rice imports and relatively low transport cost from Port Moresby to the production areas.

3. The Pattern of Comparative Advantage

The natural conditions for growing rice in Papua New Guinea are considered very favorable in some areas and quite favorable in many areas. The country is reported to be endowed with large amount of land suitable for upland rice growing. In addition to upland, the government has also identified some areas (about 36,000 ha) suitable for irrigated rice cultivation. This land resource is estimated to be able to produce about 150,000 to 200,000 tonnes of rice annually. At present land does not seem to be a limiting factor. The major constraints to rice growing in this country are found in the dominance of traditional cultivation systems, shortage of labor, and low market accessibility.

The labor to be allocated to rice growing in this country faces strong competition of labor allocated to the production of cash crops (such as coffee, cocoa, coconut), other staple crops (such as taro, yam, sweet potato, banana), and various daily tasks in the traditional societies. The prevailing cropping pattern is a rotation system in which farmers cut the trees and burn the bush on a small piece of land (ranging from 0.1 to 0.8 ha) for crop cultivation without applying any sort of fertilizers. Usually the farmers plant the crops and a same land lot for one or two years before developing another lot. However, in some areas the length of this period has increased to five years, due to population pressure and farmers' intention to save hard labor for tree-cutting. The yield level in this cropping system is very low, and the quality of rice harvested is reported inferior.

Usually farmers use straight knives to cut rice ears in harvest, store the rice ears in simple warehouses and wait until the grains fall. As farmers do not possess their own rice mills, paddy rice is transported and sold to a rice mill run by the provincial Division of Primary Services (DPS), which is generally located far from the rice fields. Farmers in turn buy white rice (either locally produced or imported) for DPS for their own consumption. In some remote areas the consumer's price of white rice is twice as high compared with the price at the urban areas. All these observed facts support the argument that lack of suitable harvesting tools, threshing equipment, transport facilities, and

access to post-harvest processing facilities is one of the major constraints to smallholders' rice production.

The above-mentioned FAO mission (see footnote 1) has conducted a comparative analysis on return to labor of the following five different farming patterns: (1) smallholder's rainfed upland, (2) smallholder's rainfed upland with mechanical service, (3) smallholder's irrigated and semi-mechanized, (4) mechanized large-scale rainfed (commercial), and (5) irrigated large-scale (commercial). The results showed that among these (2) was the single farming pattern which yielded returns comparable to the prevailing wage rate without requiring government's subsidies. The mission concluded that large scale rice growing on a commercial basis in Papua New Guinea was not recommendable neither to private investors nor to the government; the promotion of rice cultivation would preferably be confined to smallholder's traditional cropping on a subsistence basis.

IV. POSSIBILITIES FOR INTERNATIONAL COOPERATION

Following are the major findings that the Mission had concerning the perspective for international cooperation, after careful considerations of the issues discussed with national and provincial officers involved in policy-making, research, and extension activities, and observations obtained from the field trip to Morobe and East Sepik Provinces:

- (1) Under the present conditions of price and cultivation technique, large-scale rice production on a commercial basis does not seem economically viable compared with the production of other cash crops, such as coffee and cocoa, which require less labor input. However, rice imports would not be reduced if the country specializes in the production of these export crops. Rice cultivation by owner-farmers with small-scale irrigation is important to promote rice production in this country.
- (2) Basic studies and surveys on cropping (rice, taro, sweet potato, coffee, cocoa, coconut, rubber, etc.), marketing, and processing, etc. are important in search of possibilities for rural development.
- (3) Soil and topographical surveys aiming at suitable classification of agricultural land would contribute to the development of the country's agricultural sector.
- (4) Improvements in research activities, extension services, and post-harvest facilities concerning food and feed crops also seem to be a possibility for international cooperation.

Table 1 Production, Imports, and Consumption of Rice
in Papua New Guinea

| | Production (tonnes) | Imports (tonnes) | Total Consumption (tonnes) | Value of Imports (K '000) |
|------|------------------------|---------------------|-------------------------------|------------------------------|
| 1977 | 463 | 72,652 | 73,115 | 13,002 |
| 1978 | 157 | 77,665 | 77,822 | 13,843 |
| 1979 | 68 | 83,471 | 83,539 | 16,919 |
| 1980 | 202 | 96,824 | 97,006 | 24,106 |
| 1981 | 130 | 79,099 | 79,229 | 23,359 |
| 1982 | 81 | 95,576 | 95,657 | 24,846 |
| 1983 | 130 | 114,471 | 114,471 | 19,359 |

Source: Medium-Term Development Strategy, Industry Plan Discussion Paper: Rice (mimeo.).

Table 2 Rice Production Plan of the Morobe Province

| | Areas (ha, smallholders) | | | | | Production (tonnes) | | | | |
|-----------------------|--------------------------|------|------|------|------|---------------------|-------|-------|-------|-------|
| | 1986 | 1987 | 1988 | 1989 | 1990 | 1986 | 1987 | 1988 | 1989 | 1990 |
| Finschhafen | 2.5 | 3.5 | 4.0 | 6.0 | 10.0 | 40.50 | 40.55 | 40.58 | 41.00 | 42.00 |
| Wau | 1.5 | 2.5 | 3.0 | 4.0 | 5.0 | 0.20 | 0.30 | 0.40 | 0.50 | 0.75 |
| Museng | 0.75 | 0.5 | 0.5 | 0.6 | 0.6 | 0.30 | 0.35 | 0.40 | 0.45 | 0.50 |
| Lae & Other Districts | 4.25 | 7.0 | 10.0 | 12.4 | 18.4 | 1.07 | 2.00 | 2.70 | 3.55 | 4.90 |
| Total | 9.0 | 13.5 | 17.5 | 23.0 | 34.0 | 42.07 | 43.20 | 44.08 | 45.05 | 48.15 |

Source: Department of the Morobe Province, Division of Primary Services.

Table 3 Characteristics of Major Rice Varieties Bred at BUBIA

| Variety | Plant Height (cm) | Date of Maturity (days) | Yield (t/ha) | |
|----------|----------------------|----------------------------|--------------|--------|
| | | | Irrigation | Upland |
| WANTOK-S | 96 | 114 - 131 | 7.4 | 5.9 |
| TAMBU-S | 87 | 115 - 136 | 6.5 | 6.3 |
| SENIS | 88 | 106 - 126 | 6.5 | 5.2 |

Source: Dong Hin Kim & Paul Kriosaki, New Rice Varieties WANTOK-S and TAMBU-S (Agriculture Research Center BUBIA, Information Bulletin No.49), September 1986.

Table 4 Rice Production Trend in East Sepik Province (Paddy)

| Year | Production (tonnes) | Year | Production (tonnes) |
|------|------------------------|------|------------------------|
| 1971 | 1,732 | 1979 | 250 |
| 1972 | 957 | 1980 | 500 |
| 1973 | 532 | 1981 | 500 |
| 1974 | 1,023 | 1982 | 320 |
| 1975 | 615 | 1983 | 423 |
| 1976 | 856 | 1984 | 250 |
| 1977 | 932 | 1985 | 182 |
| 1978 | 150 | | |

Note: Figures in this table are not consistent with those in Table 1.

Source: Department of the East Sepik Province, Division of Primary Services.

Table 5 Summary of Major Rice Variety Experiments in
the East Sepik Province 1971-1980


| Year | Details of Trial | Results |
|---------|---|---|
| 1971-72 | Nine varieties introduced to compare with E1 in East and West Sepiks | Data collected from 4 sites; best yields at Burui; 3 varieties yielded much better |
| 1972-73 | No useful results | |
| 1973-74 | Eleven varieties introduced to compare with E1 at 3 sites | Two grassland sites affected by Lepto-coriza; at Drekikier 5 varieties including NG6637 yielded much better |
| 1974-75 | No useful results | Lack of staff |
| 1975-76 | No useful results | Lack of staff |
| 1976-77 | Fifteen varieties planted at 6 sites | Low yields at all sites (NG6637 not included) |
| 1977-78 | Fifteen varieties sown at 4 sites | Results from 2 sites only; 6 varieties yielded much higher than NG6637 |
| 1978-79 | No useful results | |
| 1979-80 | Six varieties planted at Bainyik and Gavien with fertilizers and pest control | At Bainyik 3 varieties yielded much higher than NG6637 |

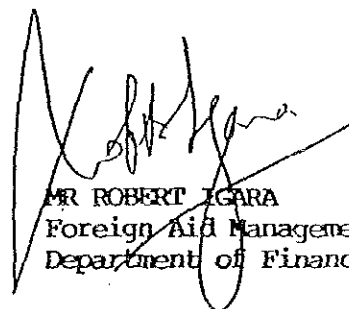
Source: J.S. Wohuinangu, "The Results of Rice Research in the East Sepik Province".

MINUTES OF MEETING FOR THE PROJECT FORMULATION
SURVEY MISSION FOR PAPUA NEW GUINEA

The project formulation survey mission headed by Mr. Atuyoshi Toda was sent to Papua New Guinea. The Mission had a series of discussion with the representatives of the PNG Government led by Mr. Igara, the First Assistant Secretary of the Department of Finance and Planning, on February 25 and 26 and reached an understanding on the following points:

1. The Project Formulation Survey Mission conducts survey to formulate projects for Japan's Economic and Technical Cooperation based on Papua New Guinea's needs and priorities for the following sectors: Road, Agriculture, Telecommunication and Fisheries.
2. Japanese consultants assigned for each sector shall complete the survey by March 18 and leave the field report on their survey results to the Department of Finance and Planning of Papua New Guinea.
3. The Government of Papua New Guinea shall provide the maximum assistance to the Japanese consultants for their survey activities.
4. Based on the field report of the consultants, the mission will make a report of its findings to the Japanese authorities concerned, who will subsequently submit the results of their consideration to the Papua New Guinea Government through the diplomatic channel by July 1988.
5. As for the Development Survey, the technical cooperation is to be extended mainly for a masterplan or feasibility study. Detailed design is out of the scope of the Development Survey and shall be dealt with as one of the components of the financial assistance.


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26 February 1988.

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