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- COUNTRY REPORT, FOREST RESEARCH IN PAPUA NEW GUINEA
- WHITE PAPER, REVISED NATIONAL FOREST POLICY

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COUNTRY REPORT

FOREST RESEARCH IN PAPUA NEW GUINEA

DEPARTMENT OF FORESTS

MARCH 1986

INTRODUCTION

Papua New Guinea lies in the southwestern part of the Pacific Ocean and covers a land area of 461 700 km² between latitudes 0° and 12°S and longitudes 141° and 156°E. The country consists of the eastern half of the island of New Guinea, the Trobriand, Woodlark, d'Entrecasteaux and Louisiade groups of islands, the Bismark Archipelago with New Britain, New Ireland and Manus and the Bougainville islands of the Solomons.

The central core of Papua New Guinea is a massive mountain chain with peaks up to 4 500 m (mount Wilhelm 4 508 m) and forming a natural east-west barrier. The mountain chain is made of a series of ranges divided by large fertile valleys at altitudes between 500 and 1 800 m. High rainfall is responsible for the existence of many rivers, which are only navigable in their lower parts. Exceptions however are the Sepik river in the north and the Fly river in the southwest, both with extensive swamps. Southwestern Papua New Guinea is a flat land covered with dry evergreen forests.

The island regions also have prominent mountains, however of much lower elevations; highest peaks in New Britain are up to 2 438 m, in Bougainville up to 2 743 m and New Ireland up to 1 871 m. These islands, with presently latent but still active volcanic phenomena, have highly fertile soils where most of the agricultural activity is concentrated.

The climate is moist and tropical except in the southwestern and central southern areas. The southwestern monsoon, which is hot and humid and brings most of the rain, occurs from December to May. High mountains and insular nature of part of the country have a strong effect on the local climates. The central mountain chain is a rain shelter for the southwestern part during the northwest monsoon and so this part is much drier and covered with savannas. There is a considerable variation in annual rainfall which ranges from 980 mm in Port Moresby to more than 5 000 mm in places in the central mountains where rainfall is distributed all over the year.

The mean maximum and minimum temperatures in the coastal area are 32°C and 23°C respectively. The diurnal temperature range varies between 6°C to 8°C. At 1500 m mid-day temperature is 6°C below coastal temperatures while at nights temperatures may be 11°C cooler. Above 2740 m frost occurs. At Mt Wilhelm and other peaks or 3,960 m occasional falls of snow are experienced.

The population is estimated at 3.1 million in 1980 with an average density of 6.6 inhabitants/km². The highlands with more than one million people have a density of nearly 18 inhabitants/km² while the Papuan coast has only less than 3 inhabitants/km². The population growth is approximately 2.5%. Agricultural population amounts to 83% of the total population, growing at an annual rate of 2.1% (FAO Production Yearbook - 1979).

1. FOREST RESOURCES

Papua New Guinea is blessed with a large natural forest resource. Over 80% of the land area is covered with forest of various types from the swamp and lowland rainforests of coastal plains to alpine vegetation and moss forests in the highlands. The different forest types have been broken into 10 major ecotypes as follows:

<u>Ecotype:</u>	<u>Area (Million ha)</u>
Alpine	0.1
Montane	1.1
Lower Montane forest	9.1
Lowland Rainforest	19.1
Grassland	3.0
Regrowth and Gardens	2.4
Savanna	2.6
Swamp woodland	1.3
Swamps	2.2
Mangroves	4.5

For thousands of years forests have played a significant role in sustaining the livelihood of majority of the people of Papua New Guinea. Forests have been (and are) the source of building and gardening materials, wildlife, herbs and plants for medicinal purposes, food and recreation. Commercial exploitation of the forests began after the World War II mainly utilizing the lowland rainforest and lower montane resource.

Much of the known potential commercial forest is committed under either the existing operations or with projects in the pipeline. Forest products is a third largest export earner and it will continue to bring in meaningful benefits if managed wisely.

2. FOREST RESEARCH

2.1 Historical

Prior to World War II there was hardly any research in forestry in PNG. The Division of Forestry in the Lands Department had few staff, and early forestry activities consisted largely of revenue collection, and assessment of the nature and location of the forest resource. This latter activity had not been carried very far before the War intervened and all activity ceased. However, a start had been made in botanical research. This was followed in the early post war years by setting aside 40 ha of degraded and partly cleared forest on the then edge of the town of Lae for the National Botanical Gardens.

It was realised then that the resource was significantly different from the Southeast Asian Countries both in terms of actual species and associations as well as volume per hectare. This affected early acceptability of PNG timbers by the importing countries even though there was an unprecedented demand in 1950's.

It was early realised that the particular characteristics of each species of timber required defining so that specific advice for end-use could be given to users. Thus did Forest Products Research Centre come into being, first as a sawn timber producer to supply Lae and Rabaul sawn timber from the two Government owned mills, and second to begin work on timber properties and their treatability in collaboration with CSIRO.

The silviculture of rainforest, on which smaller sawmills were based, is extremely complex. Coupled with the land ownership problems inherent in a village/clan system throughout PNG, it is not surprising that little except peripheral experimentation into reforestation of logged areas was carried out. Some study plots for studying Taun (Pometia) natural regeneration were laid out in 1956 but have since disappeared.

Thus the major effort went into the problems of reforesting the area of the Bulolo valley logged by CNGT (Commonwealth New Guinea Timbers), with the aim of ensuring the perpetuity of the plymill and associated activities, by replacing the indigenous resource with an adequate area of man-made forest and growing a product tailor-made for this industry.

The other major silviculture research, carried out by Operations Division (then called Silviculture) went into extensive screening trials of many species, mostly exotis. Among the most successful were Teak, balsa, (Ochroma lagopus (for the model aeroplane market, in view of its world scarcity, and the suitability of PNG conditions for its growth) and various species of Eucalypts, mainly Kamarere - E. deglupta and exotic tropical pines.

The successful results of the CSIRO work in the fields of timber physics to clarify end-uses, preservation and use of tropical hardwood mixture for woodchip to produce paper pulp, promised a sales promotion campaign, to advise the buyers of the utility of PNG species. Simultaneously attempts were made to study the availability and marketability of the minor forest products such as gums, resins, tannins, starches, bark, essential oils, seeds.

The areas of research requiring extensive and intensive attention in the post-world war II period, were:

- (i) to identify species, particularly those of commercial, medicinal or horticultural value,
- (ii) to determine commercial volumes of timber species,
- (iii) to study species characteristics for end-uses, followed by developing methods for their preservation and processing,
- (iv) to rebuild the forest resource by way of natural and/or man-made forests, agro-forestry programmes and/or other acceptable land use practices,
- (v) to preserve the environment from damage and to ameliorate the effects of unavoidable industrial impact.

2.2 Tree Improvement and seed production

During the last 20 years, provenance trials of a number of species have been conducted. Based on the results of these trials, seed orchards and seed production areas of suitable species/provenance/variety have been established both for supply of seed as well as conserving the genetic variability of the species. The present position is given below:-

Provenance trials

(a) Lowlands:

Ecaulyptus deglupta:

Trials established at Gogol, Keravat and kimbe in which 4 PNG, one Indonesian and two Philippines provenances were tested. One provenance from the Philippines and one from PNG were found to be the best. Further trials to include more PNG provenance with a view to locate an Agrilus resistant variety are plan ned.

Gmelina arborea and Acacia auriculiformis, planted in 1978/79 in randomised blocks and completely randomised lines. A first provenance selection has been made but progress suspended due to seed unavailability.

Tectona grandis:

Tested 6 Indian, 2 Indonesian and 1 Thai provenance and 1 PNG Burmesl land race. The latter found to be the best.

(b) Lower Montane:

Pinus merkusii:

Trial No. 1 - Bulolo

Tested PNG sumatran land race, Java land race, one Sumatran provenance and one Kampuchean provenance (Kirirom plateau). No significant difference between the Sumatran Javan and PNG sources. These were significantly better in growth compared to the Kampuchean provenance.

Trial No 2

Tested PNG Sumatran land race with Thai and Philippines provenances. PNG Sumatran land race superior in growth to all others. Philippines second best.

Pinus oocarpa:

Trial No 1 - Bulolo

Tested 10 provenances, 3 quatemalan, 4 honduran, 3 Nicaraguan. K42 - Yucal Nicargua, K44 - Rafucl Nicaragua and K1 - Nicaragua best provenances. These are probably the species now referred to as P. patula sub sp. tecumumanni.

Stem form, of all provenances in trial, is superior to early introductions.

Trial No 2A - Bulolo

Tested 8 P. oocarpa provenances and 2 P. caribaea var hondurensis provenance. Best provenance is MPR Belize, followed closely by Yucal, Nacaragua, Mal Paso quatemala, and Dipilto, Niaragua.

(c) Mid Montane - Goroka and Mt. Hagen:

Pinus oocarpa:

Trial No 2B

Basically a repeat of Bulolo Trial No 2A. Best provenances P. oocarpa ex Yucal Nicaragua and MPR Belize. These are believed to be P. patula sub sp Tecumumanni

Seed Production

(a) Lowlands:

Teak orchards:

Two teak orchards comprising of 29 clones of Burmese, Thai and Indian origin were established at Brown River and Keravat. Progeny trials have also been conducted.

E. deglupta orchards and Seed Production areas:

One clonal orchard, one seedling seed orchard, and one provenance seed production area have been established at Bulolo because climatic conditions in this locality produce better flowering and fruiting.

Further provenance seed production areas and progeny trials are planned.

Acacia spp programme:

Provenance collections and testing of Acacia mangium (collected 1980, stage 1 trials being established 1983). Provenance/species collections and testing of A. auriculiformis, A. aulacocarpa, A. crassicarpa (collected 1982, stage 1 trials being established 1986). Production of routine seed stock from seed production areas at Bulolo and Madang (all species), commenced 1984.

(b) Lower Montane:

Pinus caribaea:

3.54 hectares established as clonal orchards. Clones are both local and imported (31 imports, 15 local). The progeny trials are ~~get~~^y to be established. The orchards are meeting our local requirements so far.

Pinus merkusii:

One clonal orchard completed at Bulolo in 1976. An additional clonal orchard started at Nori Kori, EHP and one small experimental stand of clones and seedlings established at Bulolo for hybrid research. The main orchard is accompanied by one half site and four controlled pollination progeny trials. Trials indicate some gains in stem form through selection. Investigation of hybrids as possible source of improvement and genetic expansion has been included in programme. These are being assessed now. Hybrids are insular x continental and Tapanuli x aceh.

P. patula:

One clone bank and one seedling seed orchard in upper montane region have been established.

P. strobus var chiapensis:

Seed tree selection has been carried out and seedling seed orchards are planned. A number of pilot plantings have been converted in to seed production areas.

Acacia species:

Provenance seed production areas are being established at Bulolo for Acacia mangium, A. aulacocarpa, A. auriculiformis and A. crassicarpa.

Araucaria cunninghamii

Programmes commenced in 1960 at Bulolo. 105 seed trees and four clone banks established to produce grafting material. Main clonal orchard contains some 100 clones in approximately 3.0 hectares. A progeny trial established to test the orchard was destroyed. A seed production area has been established from the oldest plantation and is 8.09 ha in area.

Araucaria hunsteinii

Programme commenced in 1960 at Bulolo. 132 seed trees and three small clone banks established. Main clonal orchard contains about 90 clones. No progeny trials have been established yet.

Giant Leucaena

The programme at Bulolo aims to establish a number of seed sources of Giant Leucaena species to serve the rural and commercial sectors of the community. Some further provenance and breeding research is intended. Some 10 accessions have been established.

In all about 200 hectares will be developed for seed production at Bulolo. The present orchards and seed gardens in the National Research Seed Production area at Bulolo is valued at 0.5 million kina.

(c) Upper and Mid Montane

The programme in this zone has been to convert a number of P. strobilus var chiapensis plantings to seed Production areas and select seed trees to be used to establish a clonal orchard. The establishment of a seedling seed orchard is envisaged.

A P. patual clone bank was established at Lapegu and a seedling seed orchard at Serunki. The latter supplies all PNG's requirements for seed of this species. No progeny trials have been attempted due to the lack of available seed from the seed trees.

A p. mekusii clonal orchard is being established at Nori Kori to produce seed to meet local needs.

Progeny Trials

The main progeny testing so far had been with Teak and P. mekusii as mentioned earlier. Further work is intended with Araucaria and E. deglupta.

2.3 SILVICULTURE

(a) Plantation forestry:

Silvicultural Research was initially associated with plantation projects. It was applied in nature and mainly consisted to investigate silvicultural techniques for the main species selected and ad hoc species introductions and trials. Most of the work was carried out from the three forest stations (listed below) by Department of Forests district and headquarters staff.

The first plantations were established at:

Bulolo (1949/50) 80 km. SSW of Lae, Morobe Province, consisting of Araucaria spp. and later Pinus caribaea for saw and veneer (peeler) logs. (Climate: Lowermontane Subhumid);

KERAVAT (1949/50) 20 km. SW of Rabaul, East New Britain Province, consisting of mainly Tectona grandis for saw logs. (Climate: Dry Subhumid).

In 1963 an area of grassland at LAPEGU, 10 km of Goroka, Eastern Highlands Province was acquired and planting of Pinus caribaea and P. patula commenced. (Climate: Lower Montane Subhumid).

By the early 1970's applied research had been or was being done at Bulolo, Keravat, Brown River, Lapegu and at new plantation projects at:

WANGI SWAMPS (1968/72), 10-20 km. NE of Mount Hagen town, Western Highlands Province consisting of Eucalyptus robusta, E. saligna and E. grandis for industrial fuelwood. (Climate: Lower Montane Humid); and

GOGOL VALLEY (1969/75), 40 km. WSW of Madang, Madang Province consisting of Eucalyptus deglupta and a number of unreplicated species plots for pulpwood possibilities. (Climate: Lowland Humid). In 1973 staff were stationed at the newly established Baku Forest Station in the Gogol Valley and since 1977/78 a silvicultural research unit with its own programme has been operating there.

Much of the early work was ad hoc and work which was sound has been incorporated into Silvicultural Bulletins (e.g. Silvicultural of Pinus) although some are now out of print (e.g. Silvicultural Bulletin No. 1 containing most of the early work).

Documentation of general silvicultural techniques are complete for the following species, Araucaria cunninghamii Araucaris hunsteinii Eucalyptus deglupta, Pinus spp., Tectona grandis, Terminalia brassii

Between 1940 and 1967 there were over 330 seed introductions from overseas sources consisting of over 70 softwood and 122 hardwood species and varieties. Many of these failed but also many disappeared into district nurseries and were planted as individual trees or small plots and records were not kept. Since this time only a few importations of seed have taken place.

Trials which are still to be finalised include the following:

Pinus species trials (Kainantu), planted 1965/70. The 1965 trials consist of 4 species planted in 8 locations and considered as a factorial. Pinus species trial (Bulolo), planted 1965, a Split Plot Factorial including 5 species. Pinus species trial (Wau), planted 1965/66 as a Randomised Block Design. Analysis completed 1978 but yet to be written up. Pinus species trial (Wau), planted 1970/71 since partly destroyed by fire.

With the establishment of the Forest Research Station at Bulolo, research was divided into 5 project areas as follows:

(1) Lowlands reforestation

Large plantations of pulpwood were expected to be raised in the latter half of the decade of which Eucalyptus deglupta was to be the main species. As a result most of the research carried out was directed to this species, the majority of that being on its genetic improvement.

Silvicultural studies initiated included the following:

- Spacing trials (Keravat, Madang, Hoskins) planted 1970/71 in Randomised Blocks, terminated owing to a thinning carried out in 1975 nullifying the trial objective.

- Fertiliser trials 1973 & 1975 (Madang) testing nitrogen/phosphorus requirements on river terrace sites including slow release formulations. Trials showed neither to be limiting as the control trees were smaller than the fertilised ones.
- Evaluation of long term productivity (second rotation, Keravat), 1974, linked growth plots and a fertiliser trial. Sample plots show an apparent 5% growth reduction on the second rotation and the fertiliser trial showed a response to nitrogen with phosphorus.
- Survey of soil fertility at prospective reforestation areas 1974 (Madang, Open Bay), chemical properties of soil were said to be adequate for plantation growth although soil nitrogen was found to be concentrated in the topsoil layers with only low concentrations in subsoil layers.
- Diagnosis of nutrient deficiency 1974 (Madang), leaf nitrogen was found to be related to growth and a regression was determined to allow foliar sub-optimal nitrogen levels to be detected. This has never been put into practice.

Studies on other species included:

- Acacia auriculiformis, ad hoc fertiliser application on a grassland site on the Sepik Plains (Kunjingini).
- Eucalyptus tereticornis, 1975 (Kunjingini), NPK formulation in a Latin Square Response was linear therefore optimum levels were not reached.

(2) Grasslands (highlands) afforestation

Some work was carried out in the Wahgi Swamps.

- Responses to macronutrient fertilisers were obtained for Eucalyptus grandis and E. robusta.
- E. globulus imported from the Tasmanian Forestry Commission as part of the Australian Research Working Group for Soil and Nutrition, did not respond to fertiliser applications in trials.

(3) Araucaria silviculture

Work initiated included underplanting (enrichment) trials of Araucaria hunsteinii after logging in naturally regenerating areas, investigation of nursery sowing techniques, provenance testing and developing tree improvement methods.

(4) Multitple Use of Forest Land

Legume pasture trials were established to determine if tending of grassland and secondary forest growth can be reduced and to test the applicability of forest plantations for grazing.

As a result of staff reductions, silvicultural research was cut back to maintaining existing trials, further species selection, provenance testing and monitoring the effect of clear fell logging on soil erosion and river water quality. Other planned work was not carried out owing to a lack of resources such as phenology monitoring and lowland enrichment planting trials (unreplicated blocks of the latter were however established by the reforestation project in the Gogol valley).

Species trials were linked with provenance trials in most cases.

Logging monitoring consisted of sampling stream turbidity in a number of streams on a regular basis before and after logging. Results were a little inconclusive, however, as would be expected stream turbidity was higher for up to a year after logging then stabilised. The programme was terminated in 1979.

Other trials:

Eucalyptus deglupta:

Nursery trials:

Fertiliser application, Madang 1977/78 - A range of fertilisers were tested on seedling development. All had improved growth over the control but none better than the others. Spray urea is recommended as it is the cheapest and easiest to use.

Soil sterilisation, Madang, 1978 - This improved growth of seedlings in polythene tubes but as the seedlings were watered with river water the cause of the improvement is obscure.

Containers, Madang, Goroka (Pinus patula), Bulolo (P. caribaea) and Mt. Hagen (Eucalyptus robusta), 1979 - A number of different seedling containers were tried but none proved better than polythene tubes. The organic ones (peat & cellulose material) disintegrated both in storage and in the open nurseries.

Field trials:

Jiffy Pots, Madang 1978 - No differences were observed in survival or growth between 2 sizes of Jiffy pots and polythene tubes. As Jiffy pots are up to 10 times as expensive this precludes their use.

Fertiliser trial in grassland plantations, Madang 1978 - Trees responded to nitrogen and phosphorus in a NPKB trial. The effect lasted only 3 months.

Legume trials under young plantations, Madang 1977 - of 4 legumes tried under young plantation, Glycine showed the most promise as a non-aggressive climber.

Anthocephalus chinensis natural regeneration

Cleaning/thinning trials to determine optimum stocking, Madang, 1978 - Cleaning and thinning prevented early stagnation but all stocking densities from 1000 s.p.h. to 200 s.p.h. stopped growing after 3 years.

(b) Natural Forests

Majority of the timber operations in PNG are based on selective logging wherein commercial trees of 50cm DBH and above are harvested. At an average yield of 35 m³ per hectare, about 50 to 60 thousand hectares are logged annually. However so far almost no attempts have been made to manage the logged forests mainly because a viable Timber Stand Improvement technique has not yet been worked out. It has been observed that a number of timber species flower and fruit regularly resulting in profuse natural regeneration. Majority of the seedlings, however, do not survive long due to close canopy. In the past a few experiments on natural regeneration and enrichment planting were laid out but could not be concluded. One of the priority research area in Forest Management Research Branch is therefore, to intensify research on these aspects.

Experiments have been established in Anisoptera dominated forests to monitor the growth of these crops under various treatments so that such areas can be managed on sustained basis and the country does not lose its high value timber species. This area of research will be further strengthened when the UNDP aided project becomes operative.

2.4 FOREST PRODUCTS

The Forest Products Research Centre (FPRC) was established in 1965 with a view to (i) promote PNG Timbers to overseas market by providing technical information and promotional materials derived from research and literature; (ii) assist timber industry in the country by providing efficient methods of timber preservation; (iii) provide technical advice to the public. The centre has five sections, viz, (i) wood preservation; (ii) wood anatomy; (iii) chemistry; (iv) marine biology, and (v) a newly created wood processing section.

The centre has developed BFCA dip diffusion for timber treatment. Originally patented by CSIRO (Australia), the process has been reformulated to suit humid tropic conditions. Standards to control dip diffusion and vacuum-pressure impregnation are in advanced stage of preparation. Research in FPRC has resulted in development of simple and safe methods of preservative treatment at village level as documented in "Rural wood Preservation". The selection criteria for timber species as electric poles in PNG are based on the results of long term grave yard trials. A lot of information on PNG timbers is assembled in the much acclaimed publication "Commercial Timbers of Papua New Guinea".

The magnificent beams on the roof of the New Parliament house was possible because of detailed technical information on strength supplied by FPRC. A good amount of information has been collected on minor forest products, some of which occur in abundance and have commercial potential. Some aspects of mangrove forests which have not yet been commercially exploited in this country have been studied during the last five years. Research is also being carried out on the biology of marine borers and their wood degradative ability.

2.5 Agroforestry

Agroforestry systems in PNG can be broadly defined as the deliberate integration of cattle, agricultural cash crops and subsistence crops with woody perennials, such as, cocoa, coconut, Leucaena and commercial timber species. Within the forestry sector agroforestry practices include pasture development and grazing in forest plantations, and cash and subsistence cropping under trees wherever socio-economic and ecological conditions are favourable.

(i) Forest pasture development

In order to increase local beef production, pasture improvement work was started in Forest Management Research Branch in 1966 by identifying about 15 useful pasture legume species. Among the important species in this group are Desmondium intortum, Macroptilium sp. stylosanthes sp. The introduction of these legumes into the plantation is encouraged.

(ii) Cash cropping

The forest plantations in PNG have provided conditions suitable for underplanting of perennial and annual cash crops. Currently the main crops being established in research trials and demonstration plots in the highlands under Pinus and Araucaria are coffee and cardomon and in the lowlands under Eucalyptus deglupa and Leucaena, cocoa and coffee. Research is being geared to develop acceptable management systems. One of the most important advantages of this approach is the interest and involvement of landowners.

(iii) Subsistence gardening

The establishment of subsistence crops following clearfelling (or even after selective felling) and burning is a common practice in PNG. Gardening may start immediately after logging or after tree planting in clear-felled areas. The type of crops that are grown in such areas vary with climato-edaphic and altitudinal conditions. At least 16 species of subsistence crops in the lowland and 21 species in the highlands are grown in these gardens. Current research activities include selection and testing of leguminous trees and shrubs, food crops and timber trees that could be incorporated in agroforestrysystems. Research is also being carried out on the compatibility of trees species with food and cash crops, site rehabilitation and establishment and improvement of seed sources of selected species. Demonstration agroforestry plots are being established to assist extention activities.

2.6 BOTANY

The Division of Botany branch is responsible for the Papua New Guinea National Herbarium and the Papua New Guinea National Botanic Gardens, situated in of Lae city in the Morobe Province.

The botanic gardens cover an area of approximately 50 hectares and is planted with a wide range of tropical lowland trees, both from within Papua New Guinea and overseas. There are shade houses and a nursery producing cutting and seedlings of plants of horticultural importance for planting and landscaping.

The herbarium holds a collection of over 275,000 plant specimens most of which have been collected from Papua New Guinea, Irian Jaya and the Solomon Islands. Also in the herbarium is a botanical library with catalogues, references and copies of most published works on New Guinea plants.

Routine collections. Collections of specimens and live plants from all parts of Papua New Guinea is a continuous feature basis to widen our knowledge of the flora of the country.

Routine Herbarium. Routine activities such as identification and curation of Herbarium specimens. This includes the cataloguing of all available botanical literature.

Boutine Gardens. Routine maintenance of gardens plantings and grounds. Propagation and distribution of plants to government departments and the public.

Flora Project. Preparation of treatments for the Handbook flora, and the publishing of any necessary technical papers.

Phenology of Timber trees. Observations of the flowering, fruiting and flushing times of selected timber trees in the Lae Botanic gardens.

medicinal plants. A list of medicinal plants of the Morobe province is being compiled with authenticated voucher specimens. This project is required because much material brought in for identification is made by anthropologists and other botanically inexperienced people.

Seedlings of timber trees. Records of the morphology germination characteristics of timber trees are being compiled. This has been found necessary with the increasing amount of work being done in the fields of natural regeneration and re forestation.

Propagation. In the Botanic Gardens work continues on propagation and horticultural techniques of desirable and potential decorative and useful species of plants.

At present the two national botanists are engaged in post-graduate training programmes involving the preparation of taxonomic revisions: one on the genus *Mussaenda* (Rubiaceae) and the other on the confusion surrounding *Althoffia* and *Trichospermum* (Tiliaceae).

2.7 PROTECTION

(i) Forest Pathology Research in PNG

A forest pathology section was set up as part of the Forest Research Station over 10 years ago and has since staffed by 3 research pathologists. Section has a very well appointed laboratory, well qualified staff, and well organised herbarium collection. Unfortunately access to literature fairly limited.

The Section has acquired records of several forest disease problems which were listed in Research bulletin No. 33 of the Department of Primary Industries by Dr Shaw in 1984.

(a) Armillaria Root-Disease

Since 1971 basidiomes of the causal fungus have been found on logs and stumps in Nothofagus forest at moderate to high elevation from several provinces of PNG. These have been determined variously as Armillaria mellea, A. fellea and A. elegans by various authorities. Records also exist from high altitude plantings of P. patula and P. radiata, but damage has been negligible.

(b) Fomes Root-Rot (Heterobasidion annosum)

Basidiomes of the causal fungus have been found on logs and stumps of the Hoop Pine since 1976 in Morobe and Central Provinces at altitudes of 900-1700 m. The fungus has also been found at Iapegu on P. kesiya and P. patula, but no records of mortality of Pinus spp. have been reported.

(c) Brown Needle disease

This disease caused by the fungus Mycosphaerella gibsonii (conid. state Cercoseptoria pine-densiflorae), was found on 15 year old P. kesiya at Road 35, Bulolo associated with a few dead needles, and has since been isolated into pure culture. The disease is well known on several Pinus spp, including P. kesiya, in many tropical countries causing a severe grey-brown needle blight of seedlings and young trees.

(d) Shoot Blight and Tip Dieback

Shoot blight caused by the fungus Diplodia pinea has been recorded several Pinus spp. in PNG. Experience elsewhere suggest that the disease becomes epidemic only after the onset of severe stress, such as drought, hail storm damage, or insect attack.

(e) Other Pinus diseases

About 20 Other fungi appear in the Pathology Section records associated with various pines, including Lophodermium australe, Cyclaneusma minus, Pestalotiopsis sp. and a Canoderama sp. Most of these are usually regarded as saprophytes on senescing foliage, litter and bark etc. In addition there are several reports of a fungus disease of Pinus kesiya from the Eastern Highlands which causes a high rate of mortality of 1 or 2 year old trees. The cause of this has not been determined but it apparently does not affect other species such as P. strobus. Howcroft and Davidson (1974) regarded the disease as a root rot, in which case attack by fungi like Heterobasidion annosum or Rhizina undulata may be involved; alternatively a needle blight fungus, such as Mycosphaerella gibsonii which was detected on P. kesiya in November at Bulolo, could cause severe needle cast and subsequent mortality of young trees in hot wet weather conditions.

(f) Diseases of other trees

Brown root-rot caused by Phellinus noxius affects hoop pine up to about 8 years of age, and Tectona grandis. Affected trees are removed during thinning to prevent further spread of the disease, and little economic damage has been reported on the former species.

A condition known as 'Nothofagus Dieback' has been reported from natural forest areas of PNG for some years. This has been linked with infection by Phytophthora cinnamomi, but no cause has yet been conclusively established.

(g) Mycorrhiza

Pines in PNG appear to be adequately mycorrhizal and 9 putative mycorrhiza-formers have been reported associated with them. Nursery practices in the past have included the use of the 'Mother seedling' technique and inoculation with pine soil.

(ii) Forest Entomology

Forest Entomology was responsible for initiating work on forest research in PNG. When the Research Station was established at Bulolo in 1968 only entomologists were employed. This was to meet suspected insect problems in the Araucaria plantations near Bulolo.

Major pests and Candidate Pests.

I. Defoliators

(A) Lymantria ninayi (Lep. Lymantriidae)

This insect, in PNG widespread above 1,000m, is by far the most important defoliator. While its indigenous hosts are Fagaceae and Casuarina's, in plantations it has quickly acquired a taste for Pinus, P. patula being very strongly favoured. In 1976/78 a major outbreak occurred in the largest Highlands Plantation lapegu, when 500h of P. patula was completely defoliated, and some ten per cent of this died; all the deaths were among trees defoliated more than once, but these included dominants as well suppressed. This outbreak ended with wholesale death of caterpillars, which after overseas study was proven to be caused by the outbreak was by 1980 costs estimated to be I x 106k/30 year

rotation for the total area of the plantation. Research subsequently has decided that the NPV offers the best prospect of control, applied as an aerial spray.

- (B) Anthela ekeikei Alcis papuensis Pteroma plagiophleps Syntherata janetta Paradromulis nigrocellata. These five, particularly the second, have all substantially increased on P. patula in the PNG Highlands, and all must be considered potential major pests of this tree. A. papuensis is known to suffer from a local Virus and probably all may best be controlled by aerially sprayed Virus of different kinds.

- (C) Milionia isodoxa

This defoliator of Araucaria cunninghamii has proved not to be the problem originally thought.

- (D) Two defoliators of Terminalia (attacking T. brassii, T. complanata, T. solomensis) that must be mentioned are Roeselia lignifera and Scopelodes venosa which could be a problem for open planted trees ages I to 10 years in the future.

II. Under bark borers

Two beetles of the genus Agrilus (A. opulentus, A. viridissimus) as grubs are becoming important as under-bark borers of Eucalyptus (E. deglupta) and Terminalia (T. brassii) respectively. A. opulentus on mainland Papua New Guinea must now be considered a major factor affecting the production of wood-chip. Trees that are open-planted, from ages 2 years to 8 years, are attacked, and though initially only suppressed trees were at risk today it is easy to find sub-dominants with attacks as well.

Attack in particular affects increment, and protection with insecticides has shown that on bad sites one third to one half of potential volume production can be lost.

Control measures recommended include use of New Bataan Provenance, site selection for location of the Eucalyptus, plantation removal of natural Myrtaceae from the area, which are the wild hosts, and encouragement of natural predators of the Agrilus, in particular the ants Oecophylla and Anoplolepis (Crazy Ant).

III. Branchlet borer/shoot borer

The invasion of the *Araucaria cunninghamii* plantations by a branchlet mining scolytid, Hyludroctonus araucariae (Col. Scolytidae), did cause considerable concern in the past.

However it was subsequently realised that attack related particularly to poor sites and much more stringent site selection in the establishment of hoop pine allowed plantation extension to continue.

IV. Wood borers

There is probably a fairly high incidence of termite damage in lowland and lower montane plantations in PNG, though amounts are often not easy to measure for these termites attack both dead and living trees. Coptotermes elisae (Isop. Rhinotermitidae) attacks both hoop and klinkii plantations at Bulolo. This attack in the past appeared on the decline, but with the recent exploitation of thinnings commercially there is a definite upsurge in termite activity.

V. Insect pests of logs, and Forest Products

- (A) Annually log degrade attributable to ambrosia is probably of the order of 0.5 x 10⁶k in value. Exact measurement is not easy without extensive commercial timber cooperation. In bark covered logs Xyleborus barbatus and Crossotarsus barbatus and C. biconcavus cause significant loss, while in bark-free surfaces, logs and lumber, Xyleborus perforans and Platypus jansonii are of most importance. Traditional chemical methods are encouraged for control, spray with 0.5% Gammexane in diesolene for logs, and lead/ arsenic dips for lumber. Efforts are intended to encourage more use by timber companies of chemical through surveys aimed to obtain detailed figures for current losses.
- (B) Termites appear to be a major problem for converted timbers, and housing in PNG, though few figures are available.

3. PROBLEMS AND PRIORITIES IN THE FUTURE RESEARCH PROGRAMME

The new national forest policy being considered now hopes to see a coordinated research programme under the following more refined objectives to;

- (i) develop management techniques whereby national Forests are maintained in a productive state after successive tree harvest on a sustained yield.
- (ii) develop and improve techniques to increase forest productivity through forest plantations of fast growing species and those species with a high value, with emphasis on indigenous species;

- (iii) investigate and develop techniques to rehabilitate degraded sites, such as man-made grassland and savanna through afforestation and other means such as aereal seeding;
- (iv) develop techniques for multiple use of land, especially agroforestry;
- (v) develop economically viable techniques to protect forests and forest products from pests and diseases;
- (vi) monitor the effects of other phenomena (climate and fire) and the effects of deforestation and develop means of reducing their deleterious effect on the environment;
- (vii) to apply botanical research to practical problems;
- (viii) assess the properties of PNG timber species, especially of lesser known species in order to improve their utilization potential;
- (ix) promote the end use potential of forest products; and
- (x) investigate and develop techniques for improved utilization of minor forest products.

It is envisaged that a Forest Research Institute will be established in the near future in order to (i), undertake and coordinate all forest and forest-related researches especially those funded by the Government to avoid duplication, (ii) carry out related researches for organisations other than the government on an agency basis, (iii) promote and encourage the exchange of research information and personnel with similar institutions, and (iv) carry out joint research programming with other research institutions from both within and outside the country.

W H I T E P A P E R

REVISED NATIONAL FOREST POLICY

MINISTRY OF FORESTS HOHOLA 1979

REPRINT 1988— UNDER THE AUTHORITY
OF THE MINISTER FOR FORESTS

PREFACE

This document, which relates mainly to a revision of policy in the forest industry sector, has been prepared by my Office of Forests in consultation with other relevant Government Departments. A major review of existing forest policies has been considered timely; recent dampening in demand overseas for certain wood products and other related factors have affected significantly the export segment of the forest industry of this country. The Revised National Forest Policy has been designed to meet changing circumstances.

Details of the new Policy, which are outlined in the following pages, have met with the approval of the National Executive Council. Consequently the National Executive Council has directed that the Revised Policy be placed before Parliament in the form of a White Paper.

(Signed)

PUNDIA KANGE M.P.

Minister for Forests

RESUME

The concern of the Policy Revision is to relate industrial forest policy to the overall objectives of the Government, to indicate the developmental emphasis proposed for industrial forestry over the next few years, and more particularly to specify investment guidelines consistent with those objectives and that emphasis. The investment guidelines of PARTS 2-5 attempt to be specific in order that both industry and Government may judge whether in fact the details of the Revised Policy conform to its broader intentions. The new Policy attempts to encourage specific and positive comment in order to answer the questions: Within the financial and administrative resources available to Government:

- * will the guidelines encourage an increased rate of development of the forest resource in the national interest?
- * will the guidelines lead to a greater direct participation of Papua New Guineans in the timber industry?
- * will the benefits of any increased exploitation be fairly shared?
- * will the substantial investment which has already been made in wood processing be utilised for the long term benefit to Papua New Guinea and its timber industry?
- * will any new foreign investment be directed to economically viable ventures and be undertaken by efficient enterprises acting in both the interests of their shareholders and the interest of Papua New Guinea?
- * and do the Guidelines provide a framework for cooperation between the National Government and the Provincial Governments for the orderly exploitation and replacement of the Nation's forest estate?

These are the questions to which affirmative answers are required if forest policy is to be consistent with the stated objectives of Government.

INDEX

<u>CONTENTS</u>	<u>PAGE</u>
PART 1: FOREST POLICY OBJECTIVES; INVESTMENT GUIDELINES, AND THE DEVELOPMENT EMPHASIS.	
1.1 Forestry Policy - Goals and Objectives	1
1.2 Pre-Requisites for Development	3
1.3 The Central Concern and Structure of this Revision	5
1.4 The Immediate Development Emphasis	7
PART 2: PROPOSALS AND GUIDELINES FOR THE FORMATION AND OPERATION OF PAPUA NEW GUINEA LOG EXPORTING ENTERPRISES	
2.1 Introduction	12
2.2 Guiding Principles	12
2.3 Outline of the Enterprise	28
2.4 Proposed Financing	32
PART 3: GUIDELINES FOR ENTERPRISES INVOLVED IN TIMBER PROCESSING	
3.1 Introduction	34
3.2 The Type of Enterprise Promoted	34
3.3 Forest Areas Suitable for a New Timber Processing Enterprise	34
3.4 Proposed Measures to Encourage Processing	35
3.5 Guidelines for Combined Log Export - Processing Operations undertaken by Foreign Enterprises	37
3.6 Infrastructure	38
3.7 Equity	39
3.8 Papua New Guinea Associated Enterprises	39
3.9 Training and Localisation	40
3.10 Reforestation	42
3.11 Marketing	42
3.12 Other Conditions and Guidelines	43

PART 4:	GUIDELINES FOR FOREIGN ENTERPRISES INVOLVED IN LOG EXPORTING AND NOT PROCESSING WITHIN PAPUA NEW GUINEA	
4.1	Introduction	44
4.2	The Type of Enterprise Promoted	44
4.3	Forest Areas Suitable for Log Exporting	45
4.4	Specifications for An Acceptable Log Export Operation	45
4.5	Marketing	46
4.6	Log Export Taxes	49
4.7	Damages	49
4.8	Other Conditions	49
4.9	Joint Ventures	50
PART 5:	GUIDELINES FOR FOREIGN ENTERPRISES INVOLVED IN LIMITED LOG EXPORT ROAD CONSTRUCTION CONTRACTS	
5.1	Introduction	51
5.2	The Type of Enterprise Promoted	51
5.3	Forest Areas and Projects Suitable for Log Export Road Construction Contract	51
5.4	Basic Conditions for an Acceptable Log Export Road Construction Contract	52
5.5	Log Export Entitlement	53
PART 6:	ASPECTS OF NATIONAL FOREST POLICY	
6.1	Introduction	54
6.2	Forest Legislation	54
6.3	Development Priorities and the Allocation of Forest Concession Areas	54
6.4	National Ownership of Forest Development Projects	56
6.5	Integration of Agriculture and Forestry in Rural Development	56
6.6	Land Acquisition	56
6.7	Timber Acquisition and Exploitation	57
6.8	Environmental Protection	58
6.9	Reforestation	58
6.10	Extension	60
6.11	Small Scale Industry	60

6.12	Foreign Investment Policy	61
6.13	Royalties and Other Levies	61
6.14	Marketing	61
6.15	Control and Monitoring	62
6.16	Training	62
6.17	Research	63
6.18	Decentralisation: The Role of National and Provincial Governments in Forestry	64
6.19	Log Export Policy	65

PART 1: FOREST POLICY OBJECTIVES, INVESTMENT GUIDELINES AND
THE DEVELOPMENTAL EMPHASIS

PART 1: FOREST POLICY OBJECTIVES, INVESTMENT GUIDELINES AND
THE DEVELOPMENTAL EMPHASIS

1.1 FORESTRY POLICY - GOALS AND OBJECTIVES

The major aims of Papua New Guinea's policy for the development of its forest resources have been enunciated in the National Goals and Directive Principles set out in the Constitution, in the Eight Aims, and in the National Development Strategy.

The Constitution requires that Papua New Guinea's natural resources be conserved and used for the collective benefit of all Papua New Guineans and be replenished for the benefit of future generations, and also calls for:-

- (i) wise use to be made of natural resources in the interests of the development of Papua New Guinea and in trust for future generations;
- (ii) the conservation and replenishment for the benefit of the people of Papua New Guinea and posterity of the environment and its sacred and historical qualities; and
- (iii) all necessary steps to be taken to give adequate protection to flora and fauna.

In addition the Constitution requires the "strict control of foreign investment capital and wise assessment of foreign ideas and values so that these will be subordinate to the goal of national sovereignty and self-reliance, and in particular for the entry of foreign capital to be geared to internal social and economic policies and to the integrity of the nation and people". These principles are further developed by the Eight Aims and the National Development Strategy which emphasise that:-

- (i) the development of Papua New Guinea must be closely related to the rural based activities; and
- (ii) opportunities for wage and self-employment in the rural sector of the economy must be expanded; and

- (iii) natural resources must be used to generate revenue which will enable the Government to achieve its other objectives; and
- (iv) the benefits of development must be distributed as widely as possible.

Accordingly, the vast timber resources of Papua New Guinea must be used for the benefit of the nation as a whole in accordance with the principles set out above.

The National Government and all Provincial Governments must co-operate in order to achieve the objectives set by the people of Papua New Guinea, and self-interest must be subordinated to the good of the whole country.

1.2 PRE-REQUISITES FOR DEVELOPMENT

The development of a continuing and viable forestry industry in Papua New Guinea depends upon certain vital elements.

A. Timber

Whilst world demand has been depressed for some time, wood resources in large volumes are still required to satisfy the needs of developed and less developed countries.

Papua New Guinea is blessed with large areas of undeveloped forests but it must be realised that it will only be able to benefit from the opportunity to exploit those forests commercially if the people are willing to make them available. The National Government acting through the Office of Forests is charged with the obligation under the Forestry Act (Amalgamated) 1973* of purchasing timber rights from the people of Papua New Guinea.

Unless it is certain that timber is available on a long term basis no developer will be willing to commit the amounts of capital needed today for forest development enterprises.

B. Land

For a continuing and viable forestry industry areas of land, often extensive areas, must be made available so that:-

- a) industrial, housing and social facilities can be established, and as well roads built; and
- b) forest resources can be renewed by way of reforestation.

The priorities of development of timber areas will be dictated by the availability of timber and land for these purposes on a long-term basis and on reasonable terms.

* Superseded by Forestry Act (Chapter 216 of the Revised Edition of the Laws of Papua New Guinea)

C. Finance

The amount of finance required to set up and operate a forest based industry is usually very large, especially when processing facilities are constructed.

It is considered that while large-scale overseas investment compatible with the objectives of Government policy will be required for many years to come (whether in combination with Papua New Guinea capital or otherwise), there is a growing need to involve Papua New Guineans in those parts of the forestry industry where local resources allow.

Accordingly the Government will encourage the creation of groups of Papua New Guineans to undertake certain forestry activities including the harvesting of logs for export.

1.3 THE CENTRAL CONCERN AND STRUCTURE OF THIS REVISION

The intention of this Policy Revision is to specify guidelines, consistent with the forgoing objectives, for investment in the major forest products industry and with particular reference to that section of the industry which is engaged in production for export.

It is recognised that other aspects of forestry policy are important and in need of continual review. For example, existing permit conditions for the small domestic timber processor must be modified from time to time as permits come up for review; the Government must gradually increase its emphasis on forestry at village level and the integration of agricultural and forestry extension activity; minor forest product projects must be introduced through the National Public Expenditure Plan; forest products research and silvicultural research must be increasingly directed to areas of immediate practical application; forestry training must be directed to the changing needs of industry; and so on. All these changes are however of a gradual and evolutionary nature. Public expenditure will be used to ensure that forest policy remains in line with overall government objectives; and statements of this changing emphasis will be made at the time of introducing government budgets.

The export segment of the major forest products industry, on the other hand, has undergone such marked structural changes over the past few years, largely as a result of changes in international market circumstances but also as a result of changes in other government policies, that a major revision of investment guidelines and of the emphasis of Government efforts has become necessary.

A further reason for the concern with the export segment of the major forest products industry stems from the fact that Papua New Guinea has an unusually high volume of economically exploitable forest resources per head of population. This factor determines that growth and development of the forest sector must rely largely on increasing forest product exports.

It means also that forest policies most appropriate to Papua New Guinea may be very different from the policies that are appropriate to many other countries.

The detailed Policy Revision of investment guidelines and development emphasis is in five remaining parts:-

PART 2 specifies guidelines for the establishment and operation of a number of Papua New Guinean owned log exporting enterprises which, it is intended, will be the basis for much of the planned future expansion of the forestry industry, at least over the next few years.

PART 3 outlines investment guidelines appropriate to enterprises involved in timber processing.

PART 4 indicates investment guidelines for foreign enterprises involved in the export of logs and not processing any logs within Papua New Guinea.

PART 5 outlines guidelines for operations of a limited scale whereby a foreign enterprise may contract to construct important provincial and national roads in return for the right to export logs.

PART 6 intends to bring together the detailed investment guidelines of PART 2-5 under a number of forest policy headings, in order that the relationship between these investment guidelines and overall forest policy is clearer.

1.4 THE IMMEDIATE DEVELOPMENT EMPHASIS

It is proposed that the National Government will concentrate its efforts over the next few years in seeing to the efficient utilisation of existing (and firmly proposed) sawn timber capacity, and on the formation of a number of Papua New Guinean owned export logging enterprises.

It is proposed that less emphasis will be placed on the attraction and creation of additional processing capacity until such time there is a marked improvement in international markets for timber products, or when there are other changes which will alter significantly the current cost/price structure of the Papua New Guinea timber industry.

Part of the immediate emphasis will be on the increased and more efficient utilisation of existing processing capacity. Policy on this aspect is outlined in Part 3 of this Revision.

Part 3 suggests some relaxation of conditions related to processing industries, a greater uniformity of operating conditions, and the more rigid and consistent enforcement of operating conditions when this degree of uniformity has been achieved.

It is important to stress that while decreased emphasis will be given to the creation of substantial additional processing capacity, the full utilisation of existing (and firmly proposed) processing capacity is regarded as vital. A number of large sawmills with the potential to produce a high quality export product have been established, at some cost to both the Government (revenue forgone) and the private sector (low or negative returns to investment). This processing industry will play an important role in the penetration of export markets, which will form the foundation for the future expansion of the timber processing industry in Papua New Guinea. However, this may be a long term task. The incremental gains from creating additional processing capacity, in current economic circumstances, is not thought to match the costs in terms of revenue that will be forgone by the Government in the attempt to encourage further investment in processing.

Notwithstanding the emphasis that will be given to the better utilisation of existing processing capacity, the guidelines in Part 3 are intended to apply also to new foreign enterprises desirous of becoming involved in timber processing only. Investment by firms with sound experience in timber processing and in the marketing of processed forest products will continue to be promoted.

The immediate emphasis of Government efforts concerning new development will be on the formation of a number of Papua New Guinea owned export logging enterprises, established within firm organisational guidelines, and commenced in accordance with strict national forest development priorities. The proposed organisational structure of these companies, and the procedures for their establishments are dealt with in Part 2.

The main reasons for concentrating on the formation of Papua New Guinea export logging enterprises are:-

- (i) The conclusion that it is not sensible to defer forest exploitation until the market for processed forest products substantially improves, and the belief that a base for the future export of processed products (particularly of lesser known species) will itself rely on a larger volume of log exports over a number of years.
- (ii) The view that the capital requirements, management expertise, and marketing organisation for log export operations do not necessarily require foreign shareholding; this is consistent with the urgent need to increase the proportion of Papua New Guinean ownership in the forest sector.
- (iii) The belief that properly structured and well managed log export operations can benefit the people of the area, Provincial Governments, and the National Government by contributing Government revenue, profits to shareholders, employment, infrastructure, and funds for reinvestment in follow-up agricultural development or reforestation.

However, it is obvious from the history of log exporting programmes in other countries that log export operations can be exploitive and can effect adversely the people and the environment of forest areas, thus yielding less than compensating benefits to the nation.

For this reason, Part 2 proposes firm guidelines for the formation, financing, structure, management, and operation of log export enterprises within individual timber areas; and stresses the need to determine a sensible total log export programme for Papua New Guinea and to fix development priorities at the national level.

Parts 2 and 3 thus together propose a number of immediate measures which have the joint aim of encouraging and consolidating existing processing industry, encouraging new investment by firms with wide experience in the timber processing industry, and increasing Papua New Guinea involvement in the timber industry.

In the evaluation of new foreign investment proposals increased regard will be paid to the management experience and competence, the marketing organisation, and the financial capacity of the enterprise concerned. The Government will in future be as concerned with who it will deal with as with the deal itself. Within each of Parts 3 to 5 a statement is given therefore on the type of foreign enterprise sought for each type of timber project.

Part of the aim of these guidelines (Parts 3 to 5) is to reduce the matters subject to negotiation between the proposed investor and the Government and thereby reduce the time involved in negotiation. From the investors point of view, he can more easily determine whether an acceptable deal is likely to be negotiable. From the Government's viewpoint it will allow a greater amount of time and effort to be devoted to the formation of Papua New Guinea owned enterprises under the guidelines of Part 2.

Two further matters remain to be emphasised:

- * The need to determine and abide by nationally determined forest development priorities.

- * The need to ensure that the national forest estate is managed on a continuing basis to benefit current and future generations.

In order to prevent the uncoordinated exploitation of the nation's forest resource it is essential that the National Government adjudicates on the competing needs of the various timber areas and provinces. For this purpose this Revision is being accompanied by a National Forest Development Plan which has been circulated to various National Government Departments and later to all Provincial Governments for comment before it is finally modified and approved by the Minister for Forests. The Minister for Forests has the powers under the Forest Act and obligation under the Constitution to ensure the orderly allocation of concession areas and the wise management and replacement of Papua New Guinea's forest resources. The National Forest Development Plan will be reviewed from time to time by the Minister, again after consulting with Provincial Governments.

As it is noted at the outset it is not possible for the national forest estate to be managed on a permanent basis, for the benefit of current and future generations as is required by the Constitution, unless land is made available for follow-up land development on areas logged. There is currently no effective and simple means by which the Government can gain access to suitable underutilised land in logged areas. A practical and effective procedure for co-operation on this matter between the National Government, the Provincial Governments and the people of the forest area is proposed. This procedure, to ensure the social stability and the continuity of economic activity in logging areas, is outlined in detail in Part 2. Briefly it is proposed that a land use plan will be drawn in each forest area and measures taken to ensure that an effective follow-up agricultural or reforestation project will be implemented.

If sufficient suitable land cannot be acquired prior to commencement of logging, and if because of this social stability in the forest area cannot be guaranteed for the operation, then the National Government will not risk the temporary exploitation of a

forest area, with no regard to the needs of the future, but rather it will defer development of that forest area in favour of areas where a more stable operation is assured.

Finally, in framing these guidelines the Government has had uppermost in its mind the concept that only investment that yields the investor a reasonable rate of return can, in the long term, be of maximum possible benefit to the people of Papua New Guinea. Thus, with the greatest economic circumstances firmly in mind, these guidelines are aimed at allowing and fostering profitable enterprises. While saying this we should immediately recognise that the cost structure of industry, available technology, international market prices, and the availability of capital are all subject to change. While these guidelines are considered to be appropriate in current economic circumstances, they must evolve to suit changes circumstances. Comment by the existing timber industry and by prospective investors will always be welcomed, in order that investment proposals that are clearly in the long term national interest shall not be blocked by inappropriate government policies.

**PART 2 : PROPOSALS AND GUIDELINES FOR THE FORMATION AND OPERATION OF
PAPUA NEW GUINEAN OWNED LOG EXPORTING ENTERPRISES**

PART 2: PROPOSALS AND GUIDELINES FOR THE FORMATION AND OPERATION OF
PAPUA NEW GUINEA LOG EXPORTING ENTERPRISES

2.1 Introduction

It is proposed that the National Government should assist, by way of finance and advice, the formation of a number of Papua New Guinean owned log exporting enterprises. This proposal follows an analysis of the profitability, problems, and prospects of the Papua New Guinean timber industry. From this analysis it is concluded that:-

- * log export operations can be very profitable and can be nationally beneficial; and
- * log export operations need not necessarily rely on foreign shareholding; and
- * there is an urgent need to increase the proportion of Papua New Guinean ownership in the timber industry.

However, experience in those other countries whose forest development efforts have been based mainly on log exports has demonstrated that there are significant hazards associated with ill conceived and poorly managed log export programmes.

This Part specifies guidelines for the formation, financing, structure, management and operation of Papua New Guinean log exporting enterprises to ensure that these hazards are minimised and that the log export programme is in the national interest.

2.2 Guiding Principles

The following sub-sections outline the types of problems that may occur with ill conceived log export programmes, and also indicate the measures that will be taken to ensure that the proposal to increase the volume of log exports benefits the people of the forest areas and the nation:-

A. The Need to Retain National Government Control over the Total Volume of Log Exports, and the Need to Determine Forest Development Priorities

The species composition of Papua New Guinea's forest is different from that of the Pacific region's three major hardwood log exporters - Indonesia, Malaysia and the Philippines. Many of Papua New Guinea's species reach a different end-user to the bulk of regional log exports, and could be considered to directly compete in only a small part of the total log market. The conclusion should not be reached that, because Papua New Guinea's log exports comprise only a small percentage of the total regional log market, a substantial rise in the volume of its log exports will have little effect on price.

Rather, if the rate of growth in the volume of log exports is too rapid, and if the final ceiling on the volume of log exports is too high, then export prices for Papua New Guinean logs will fall.

If real log export prices fall significantly below current price levels then log export operations may not be profitable. It is therefore proposed:

- (i) that there will be strict National Government control over the allocation of timber concessions and the granting of log export entitlements.
- (ii) that the National Government will specify guidelines in order to determine fairly priorities for the allocation of log export concessions between various areas and provinces.
- (iii) that log export prices and market projections will be closely monitored in order to fix total log export quotas and that export log sales be more actively promoted, in particular of lesser known species and sales into new markets. In addition there will be some direct selling of export logs by a marketing agent created by the State.

Given adequate controls over the allocation of concessions, and given reasonable market promotion, there is every expectation that real log export prices will increase over the next 5-10 years. (IBRD Commodity Price Projections; Bank of America Asia Pacific Report). The profitability of log export ventures will then be assured.

B. Increasing Papua New Guinean Ownership and Control

There are logical reasons (beyond the obvious need to increase Papua New Guinean participation in the timber industry) for concentrating on Papua New Guinean ownership of the log exporting section of the industry:

- a) Log Export projects are not capital intensive (rather they are 'natural resource intensive') compared for example with the timber processing industry or with most large scale mining ventures. Sufficient capital would seem to be available from sources other than foreign equity to commence a number of log export operations which are desirable given the limitations of (A) above. Projected profitability of log export projects and their capacity to repay loans would seem to justify increased international (commercial) borrowings if this is necessary.
- b) The incentive for 'profit sharing' or 'transfer pricing' is often high in a natural resource intensive project (i.e. a project in which a high proportion of final product value comprises the value of the resource itself. The true value of the 'standing tree' is very often 25% or more of the f.o.b. log price, and is very high for good species in favourable locations). If an overseas firm earns 'excessive' profits the Government is encouraged (reasonably) to impose higher royalties or export taxes. This possibility provides an incentive for the firm to shift profits to overseas affiliated companies.

Further, the opportunity to shift profits is greater in the log exporting industry than it is in industries with a more homogeneous product, for which an international reference price is readily available (e.g. copper). This is particularly true in Papua New Guinea which has a very diverse species mix. There is no widely accepted free market price for most of these species. Added to this is the variation in log size, log form, defects, and the sensitivity of log value to all these aspects.

The bureaucratic costs of implementing a completely satisfactory 'guideline pricing' system can be excessive. It can be less costly to avoid or diminish the need for controlling transfer pricing.

Further, the relatively small size and variable management efficiency of log export operations makes it impractical to implement an efficient and just 'excess profits tax' system which can be undertaken (within limits) for large scale mining ventures and which ensures that the returns to 'capital at risk' and returns to 'resources' are fairly divided between the investor and the nation.

For these reasons it is concluded that foreign equity investment is neither necessary nor desirable in log export projects as much as it is in other sections of the Papua New Guinea economy.

Similarly it is undesirable for the marketing of logs to be under foreign control through the provision of loan financing (as against equity financing). This form of foreign control has become increasingly prevalent in those log exporting countries which have favoured national ownership (or at least joint-venture participation) of log export projects. These logging projects have been allowed to be financed by overseas log buyers in return for a first right (or sole right) to purchase logs. This is a particularly costly form of project financing, because it reduces competition in the log export trade, and also

because (given the problems with assessing the 'fair' value of a mixed species shipment of logs outlined in (b) above) the normal 'legal' protection clauses' (e.g. 'provided that the price is fair and competitive', etc) often have no practical effect.

For these reasons it is proposed that;-

- (i) The Department of Commerce (Business Development) and the Office of Forests will assist in the early formation and sound operation of several Papua New Guinea log export enterprises according to the guidelines specified herein.
- (ii) Foreign investment in log exporting will be restricted to more capital intensive projects (e.g. where agricultural development, woodchipping or reforestation is an integral part of the project. Refer Parts 3 to 5).

Further, within sensible total log export quotas determined under A above, preference will be given to the allocation of log export entitlements to Papua New Guinea enterprises.

- (iii) Arrangements or agreements whereby overseas log buyers may significantly inhibit competition in log marketing (for example by the provision of loan financing in return for sole right to purchase logs) will not be permitted. Log export entitlements will not be issued to operations financed on this basis.

C. Ensuring Broadly Based Ownership and a Fair Distribution of Benefits

In some overseas countries, 'ownership by nationals' has been part of log export policy. However, in some instances, national shareholding has been restricted to one or a small group of people in favour with that section of government

responsible for the allocation of timber concessions. This has resulted in an inequitable distribution of the benefits from the exploitation of forest resources.

While it is recognised that government policies should to an extent encourage rewards to initiative, the rewards from the exploitation of a natural resource, often being due more to the value of the resource itself rather than to the 'initiative' of one or a few individuals, should be widely shared. It is proposed therefore that:

(i) The shareholding in Papua New Guinean log export enterprises will be held by one or a combination of the following groups:

- * the National Government
- * the provincial government
- * the people of the forest area.

In general it is proposed that larger log exporting enterprises (50,000 cubic metres or more per year) will have a majority shareholding held by the provincial government (e.g. the Provincial Development Corporation) and minority shareholdings held by both the National Government and a group representative of the people of the forest area. The proportions of shareholding may change over the life of the project as, for example, part of the National Government shareholding may be acquired by the Provincial Government or local people using royalty or dividend payments from the projects.

The shareholding in smaller log export operations may be limited to the people of the forest area, or to a joint venture between these people and the Provincial Government.

National Government directors on the larger log export ventures will perform the important role of transferring experience from one operation to assist others.

- (ii) A broadly based shareholding by nationals will, to some extent, lessen the need to determine an appropriate 'resource tax' (The tax required to allow a 'fair' return to capital, after payment of all other charges including (in this case) royalty to provinces and timber owners, and company taxes). However, the level of export taxes (which in effect acts as a 'resource tax') will be reviewed from time to time (suggested at five yearly intervals or in the light of any significant permanent change in timber markets) to ensure that, while a well managed operation may achieve good returns to investment, Papua New Guineans in areas with a less fortunate resource endowment can benefit by the redistributing effect of government taxation and public expenditure. With this in mind the export tax will be initially fixed at 10% of the f.o.b. value.

D. Ensuring that log export operations are commercially orientated

An appreciation of the potential benefits of both national ownership and broadly based shareholding will not guarantee success of log export ventures. This has been indicated from experience in other countries where in some cases a different problem has occurred: Government "forest development corporations" involved in log exports may come to be regarded as a non-commercial "arm of government".

The profit objective may become subsidiary to other objectives such as creating employment and constructing infrastructure.

While appreciating that the creation of employment, the building of roads and houses, etc, are important benefits to be derived from log export operations, it is considered essential that the commercial objective (placing logs on-ship at least cost, and maximising revenues by efficient marketing) should be the main objective of management of these operations.

There are good reasons for the importance that will be given to the commercial objective of these ventures, at least during the early years:-

- a) Habits learned in undertaking ventures with ill defined objectives (which can result in an excessively 'padded' enterprise) are difficult to reverse. On the other hand, if, after a number of years it is decided, as a conscious policy, to shift from the narrow commercial objective to broader objectives then this will be possible.
- d) Funds for the setting up of Papua New Guinea log export enterprises are limited. A definite order of development priorities will be established at National level to decide between the various 'competing' forest areas based on equity and needs. Each commenced Enterprise will have an obligation to repay loans at the earliest practical date.

It is proposed that:-

- (i) each such major log export enterprise will be managed for at least 10 years under a profit-incentive based management contract, and tendered internationally. Tenders will be assessed more on the basis of the experience and ability of the tendering management group than on the cost of the management contract. It is realised that competent management must be suitably rewarded. The management contracts will include a requirement to train Papua New Guineans in all aspects

of the operation: equipment handling and maintenance, logging supervision, company accounting, marketing, and overall management - so that the operation may be efficiently managed and controlled entirely by Papua New Guineans at the expiry of the management contract period.

Smaller log export operations will be assisted by the Department of Commerce (Business Development) in the recruitment of efficient management, and in establishing an efficient organisational structure.

- (ii) The obligations of the Papua New Guinean log exporting enterprises related to such matters as road construction, housing, other infrastructure and employment (as contained in the Timber Permit and Forest Working Plan) will be based on a reasonable commercial basis. If, for example an important provincial road is to be constructed within the forest area (or outside the forest area) well ahead of the direct logging needs of the enterprise, then this may be undertaken by the enterprise on a contract basis, rather than be thrust upon the enterprise as a non-pecuniary benefit expected from a public corporation.
- (iii) The enterprise will be required to use the bulk of early profits for repayment of loans or reinvestment in the log export operation, rather than to be distributed as dividends, or used to embark on an activity unrelated to logging.
- (iv) Follow-up agricultural development or reforestation will be funded, organised, and managed as a separate project.

E. Ensuring a Commitment to Follow-up Agricultural Development or Reforestation

Unless there is "follow-up" investment in agricultural projects or reforestation, export logging operations, while being commercially successful, may impose a high social cost on the people of the forest area. Social dislocation may result from a temporary build up in economic activity followed by a rapid decline when the forest resource is logged out. This has been the experience with a number of export logging operations elsewhere.

On the other hand if there is a rigid formula for reinvestment in the area (such as "x% of gross revenue shall be reinvested in the forest area" or "there shall be a reforestation programme sufficient to fully replace the resource logged") then the following may result:-

- a) Follow-up land use projects may be very inefficiently managed, being designed to use up available funds rather than maximise benefits to the community.
- b) The extent of follow-up land use may bear no relationship to the potential of the area or to the needs of the people of the area (e.g. project size may not be related to the size of the population).
- c) A large number of reforestation projects may be undertaken, many of which will be poorly located or too small as a base for industry at the time of harvest (in most cases after the year 2000).

In order to ensure that appropriate follow-up development occurs, the following is proposed:-

- (i) A land-use planning and project monitoring group will be set up within the Department of Primary Industry comprising: two land-use planning officers (forests and agriculture), a land utilisation economist, and a logging management plans officer.

- (ii) At the time of conception of an export logging venture and before arrangements are finalised by National and Provincial Government officers, a land-use evaluation will be undertaken and a land-use plan drawn up. If low land-use potential or poor prospects for land acquisition indicate that a log export operation may be inappropriate to the area then the project may (at least) be deferred in favour of another area.
- (iii) In conjunction with the detailed feasibility study of the export logging operation, preliminary economic feasibility studies of alternative forms of land use will be undertaken and the most suitable land-use project specified (types, sizes, location, funding, land acquisition, staging etc.) The staging of the follow-up project will tie in with the logging management plan of the log export operation.
- (iv) At the time of submitting the log exporting project for government funds approval (via the NPEP process) proposals for follow-up land-use will be included as part of the 'package', but will be funded and managed separately to the logging operation.

The proposals for financing the land use project may take any of several forms, examples of which are:-

- * An indication that a suitable land use project might be undertaken by the Provincial Development Corporation and/or by the people of the area, using timber royalty revenue that will flow from the project (supplemented perhaps by Development Bank loans).

- * Eligibility under the National Investor Scheme, whereby the Government will provide loan funds to local groups and Provincial Governments to enable these groups to take up equity portions in the land use project. Such funding will be a maximum of 50% of the project's total funding requirements. The balance will need to be funded by commercial banks, thus ensuring an objective commercial assessment of the project.
- * An indication that follow-up agricultural development can be safely deferred to later years of the export logging project e.g. because of low population in the timber area, because the most suitable land will not be logged till the later years of the project or because the rate of exploitation relative to the size of the resource is low.

In other words an application for finance for the project may be an integral part of the original NPEP submission, or the need for national funds in later years may simply be 'flagged' for the attention of planning authorities (and actual financing will depend on later detailed feasibility studies) or no national government funds may be required. The proposals will be designed to suit each area provided that some authority at some stage will have the obligation to undertake a project of sufficient size to prevent social dislocation in the forest area. The evaluation and monitoring of this entire process will be the responsibility of the land-use planning group set up under (i)

- (v) In each case land for follow-up agriculture or reforestation will be acquired prior to the commencement of logging. This is regarded as essential, because the inability to acquire sufficient suitable land will otherwise be the

factor most likely to jeopardise sound follow-up development. If sufficient reason to defer the project in favour of some other area, rather than risk the possibility of an exploitive logging operation. From experience in other forest projects the only time land acquisition can be reasonably negotiated is prior to the commencement of logging and the construction of roads.

- (vi) Reforestation projects will be evaluated and submitted as part of the National Public Expenditure Plan for approval on the same criteria as other projects - this is in order not to waste public money on ill conceived projects. Feasibility studies for reforestation will take into account factors which influence particularly the economic viability of reforestation including: plantation size, haulage distance to market or to port, terrain, alternative uses of land, plantation establishment costs, and projected future forest product markets.

Recognising that Papua New Guinea has sufficient forest resource to meet domestic timber needs for the foreseeable future (except in certain areas such as the Highlands Region where reforestation to meet local timber needs will be stressed), the objective will be to establish a limited number of large economically viable reforestation projects at carefully selected sites.

These projects must in general be capable of supporting a processing operation in conditions likely to prevail after the end of this century.

The National Government will be responsible for the planning and evaluation of reforestation projects and an officer will be appointed within the Office of Forests for this task.

F. Ensuring Adequate Forest Management Controls:-

In certain instances log export operations have had an overly destructive effect on the forest and adverse consequences on the people of the area by:-

- * careless selective logging which destroys trees not logged, or it can inhibit regeneration.
- * marked fluctuations in the level of logging activity as a consequence of changes in log markets.
- * an overrapid logging out of the forest resource of an area (without follow-up development).

While these problems are not unique to export logging they may be more severe than they are for timber processing operations. This is largely because processing capacity is more fixed, and because also the economic (working) life of processing facilities is longer than for logging equipment. This makes logging for export a 'less stable' type of operation. For example, there is often greater pressure on government to increase log export quotas to take advantage of an upturn of price movements. There may also be less regard for the wishes of the people of the forest area, as the export logging operation may not see itself as a permanent part of an area's economy.

However, there is no fundamental difference between logging for export and logging for domestic processing. Both require firm controls over logging practices. It is proposed that:

- (i) there will be a firm ceiling on the volume of logging in each area. The maximum annual log harvest will take into account:
 - * the economies of export logging (utilisation of shipping capacity, equipment utilisation, and 'economies of scale' in relation to management, marketing and infrastructure).

- * the extent of available forest resources in the area to be logged (including logical extension areas).
- * the opportunities and the needs for follow-up agricultural development and reforestation, and the time staging of the most appropriate follow-up project.
- * available funds, and the need to spread the benefits of forest operations among provinces and areas.

The objective will be to determine logging programmes that are neither too small as to be uncommercial, nor too large as to prevent stability and continuity of economic activity in forest area, nor require too great a proportion of available funds.

- (ii) A forest management (logging) plan will be approved by the government prior to the commencement of logging and will form the basis of government control over logging activity. The plan will be annually reviewed by the Company, with the approval of the Government being required for any proposed revision.
- (iii) All timber permits will contain standard forest environmental control provisions.

G. Using the Export of Logs to Establish a Market Base for a Future Processing Industry

The export of larger volumes of logs should be used not only to create immediate benefits but also to establish a base for the future expansion in sales of processed forest products. Greater sales will not occur unless there is a marketing programme designed specifically for this purpose.

If, for example, logs are sold mainly as mixed species shipments but with no real effort to promote and inform users of the properties of the more commonly occurring but lesser known species, then many of these species will go to inappropriate and inferior uses. The longer term benefits of offering users assured volumes of particular species over an extended period will be lost.

Further, if there is no active campaign to diversify markets into where logs are sold, Papua New Guinea will remain dependant on the economies and the policies of one or two log buying countries.

A competitive price for logs and a sound market base for a future processing industry will be achieved only by:-

- * the promotion of, and the provision of information on the more common forest species
- * the active selling of logs into diverse markets
- * assuring final end users of access to particular species, initially in log form and later as processed forest products, and in adequate volumes and on a permanent basis.

It is proposed that:-

- (i) The Office of Forests through its Forest Products Research Centre and the Forest Industries Council of Papua New Guinea (FIC) will jointly expand their efforts to promote Papua New Guinea's major species (20 or so species).
- (ii) All Papua New Guinean log exporting enterprises will be required, on request, to sell up to 25% of total log volumes to the marketing agent created by the State in order to allow the agent to enter into sales contracts which are in the long term interests of the Papua New Guinea timber industry (in particular to sell lesser known species and to sell into new markets).

(iii) The management contract, internationally tendered for each proposed Papua New Guinean owned export logging enterprise (see D. above), may include an undertaking to market into several countries and to actively promote the sale of the major species of the timber area in the interest of the long term profitability of the logging company. In later years it may be appropriate for the State marketing agent to take over the marketing function of all logs harvested by National logging enterprises.

H. Summary

The proposals for the formation and operation of Papua New Guinean log exporting companies should be regarded as a package whose components cannot usefully be separated: take away national control and ownership and the main benefits may go to foreign shareholders; take away the fixing of strict priorities for development and the volume of log exports may increase to a point where prices will fall and all will lose; take away group participation in shareholding and only a few will benefit from the exploitation of a resource that belongs to many; take away commercial orientation and the project will become padded and profits will fall; take away follow-up agricultural development or reforestation and social instability in the timber area will result; and so on.

However if the National Government, Provincial Governments, and the people of timber areas co-operate in the formation financing, management and operation of these proposed enterprises they can all derive great benefit from such operations.

2.3 Outline of the Enterprise

This selection covers briefly the concept of the proposed log export corporations. Further details of the points raised are given in Section 2.2 (Guiding Principles).

a) Proposed Ownership Structure

The shareholding in each Papua New Guinean log exporting operation will be held by one or a combination of the following groups:-

- the National Government
- the Provincial Government concerned
- the people of the forest area.

b) Size

The size of each enterprise will depend on the volume of available forest resource in each project area, and the prospects for agricultural or reforestation follow-up development. Normally it will cater for at least a twenty (20) year project life based on the logging out of the natural forest. A minimum and maximum log export volume per annum will be set.

The objective will be to determine logging programmes that are large enough to be commercial, but not large as to affect stability, or prevent a continuity of economic activity in the forest area, or draw disproportionately on available funds.

c) Proposed Activity:

Each enterprise is expected to have the strict commercial objective of initially placing logs on ship at least cost through efficient management, and maximising revenues by efficient marketing.

The enterprise will be required to use the bulk of early profits for repayments of loans or reinvestment in the log export operation, rather than to be distributed as dividends, or used to embark on an activity unrelated to logging.

Initial production will be for log exports only. Prospects for a small sawmill to meet local sawn timber needs or processing for exports will depend on later feasibility studies.

d) Financial Obligations:

Each corporation will pay normal royalties and export taxes. The export tax will be fixed at 10% of F.O.B. value. The roading - logging plan will take into account the roading requirements of the area or Province, but no non-commercial roading obligations will be placed upon the company.

e) Proposed Financing. (discussed in detail in Section 2.4)

Funding of feasibility studies and pre-incorporation expenses will be under the NPEP. A maximum debt/equity ratio of 2:1 will be used as a guideline. Loan finance for each project will be by application to the PNG Development Bank or some other commercial financing institution. Equity will initially be funded under the NPEP, but be repaid out of royalties and dividends.

f) Proposed Management.

Each project will be managed in the early years under a profit incentive based management contract with an experienced overseas group. This management contract will include provisions for training of Papua New Guinean understudies in management, logging supervision, company accountancy and marketing. Each enterprise will be set up initially by a Co-ordinator of Forestry Development Corporations of the Department of Commerce (Business Development) who will work in close liaison with the Office of Forests.

g) Marketing

Each corporation will in general market its own logs. It is envisaged that each corporation will employ overseas marketing agents, but there will be a requirement that a percentage of logs be available on request, to the marketing agent created by the State.

This is in order to fulfil marketing contracts arranged in the interest of export market diversification and product promotion. In certain cases the logging company may be required also to supply logs to an existing processor who has limited available resources.

h) Setting up Procedures.

A National Forestry Development Programme will be established by the National Government in liaison with Provincial Governments. In ranking areas of priority, for setting up log export enterprises consideration will be given to the following factors:-

- i) prospects for commercial logging;
- ii) availability of timber rights;
- iii) the extent of other economic development in Province or Region;
- iv) prospects for follow-up land utilisation;
- v) potential conflict with future large scale operations;

i) Follow-up Land Utilisation:

Whilst follow-up land utilisation in each area is regarded as essential for social stability, the organisation, funding, and type of programme will be determined separately, and in accordance with the needs of each case. For this purpose a land utilisation group will be formed, to consider one or a combination of the following uses of land:-

- i) Village based agriculture or tree farming.
- ii) Large scale commercial reforestation undertaken by National Government and/or the Provincial Government.
- iii) A large scale agricultural project undertaken by either the National Government, the Provincial Government or a foreign company (nucleus estate type project).

2.4 Proposed Financing

- a) The funding needs of the proposed Papua New Guinean log exporting enterprises falls into two stages, they being:
 - i) Stage 1 - the detailed project feasibility study and project planning effort.
 - ii) Stage 2 - the implementation stage, including purchase of equipment and funding of working capital.
- b) It is envisaged that Stage 1 will be funded mainly under the National Public Expenditure Plan (NPEP) with possible limited supplementation from Departmental funds and Foreign Aid. K19,000 has been approved under the NPEP for 1978, with a further K35,000 approved for each of 1979, 1980 and 1981. Further NPEP funding has been requested to complete Stage 1 of the first 3 project areas. Further funds requested but yet to be approved are 1979 - K89,000, 1980 - K167,000, 1981 - K143,000, 1982 - K164,000. It is envisaged that the cost of the feasibility study and planning of each project area will be capitalised and treated as part of the National Government's equity contribution.
- c) The national logging companies will be eligible for funding under the National Investor Scheme (NIS). The NIS (funded annually under the NPEP) extends loan finance to Provincial Governments and local groups to enable these parties to take up their equity shares in the proposed corporations.
- d) A debt/equity ratio of 2.1 for total debt, is envisaged. Total equity requirements (about - K800,000 per project) will be sought through the NPEP (via the NIS) to supplement Provincial Development Corporation funds. It is planned that any NPEP funds advanced to a Province to purchase equity will be repaid out of the Province's share of log royalties. (the share of royalty paid to Provincial Government is K1.50 per cubic metre).

- e) The repayment of debt by each enterprise is assumed to be in accordance with a relatively tight schedule (say 3 to 5 years) such that the majority of the cash flow surpluses (excluding profits required for equipment replacement etc) will be used to repay loans before dividends are paid and before the enterprises embark on any further investment. Without this obligation, some profitable projects would be deferred, or greater foreign investment may be needed to undertake a reasonable forest development programme.

PART 3: GUIDELINES FOR ENTERPRISES INVOLVED IN TIMBER PROCESSING

PART 3: GUIDELINES FOR ENTERPRISES INVOLVED IN TIMBER PROCESSING

3.1 Introduction

The guidelines of Part 3 are intended to encourage the effective utilisation of existing timber processing capacity in Papua New Guinea, and to encourage enterprises which have extensive experience in the production of processed wood products to commence new economically viable timber processing operations in Papua New Guinea. These guidelines apply particularly to larger timber processing operations (with a log harvest in excess of 40000 M3 per year) and more particularly to those operations dependant on export markets. Guidelines will vary for the small processor supplying only a local domestic market.

3.2 The Type of Enterprise Promoted

The Government in particular seeks investment in timber processing by firms who have had extensive experience with processing operations comparable to that they propose in Papua New Guinea. The appropriate investor will be able to demonstrate a record of profitable and efficient timber processing activities, will have had experience in forest products marketing, and will have the financial capacity to undertake the proposed venture.

An Applicant for a forest concession will be asked to supply details of:-

- * Past experience and current commitments
- * Affiliated companies
- * Financial worth
- * Principal officers and directors
- * Major Stockholders

in accordance with the Government's "Guidelines for the Preparation of Forest Development Proposals".

3.3 Forest Area Suitable for a new Timber Processing Enterprise

Any Papua New Guinea forest area may form the basis of a proposed timber processing enterprise provided that:-

- i) the resource has not been allocated or prior rights granted to any other enterprise; and

- ii) Timber Rights have been acquired or can be expected to be acquired; and
- iii) the forest resource is suitable to the type of processing proposed (i.e. the proposal is technically sound); and
- iv) a feasibility study shows that the proposed venture can be expected to be commercially viable using the resource proposed; and
- v) if log exports are to be included, the forest resource is suitable (Section 4.3); and
- vi) the proposal is in other respects consistent with Government policies and priorities.

3.4 Proposed Measures to Encourage Timber Processing

The following measures are designed to consolidate and encourage the use of existing sawn timber processing capacity and to encourage new investment in timber processing conforming to 3.2 and 3.3 above.

- i) There will be a relaxation of log export restrictions for those timber processing enterprises which in the opinion of the Government have poor access to domestic markets and whose concessions have an inferior resource composition (Section 3.5).
- ii) A taxation incentive will apply to the growth in exports of processed products as announced by the Minister for Finance in the 1978 budget (50% of profits from growth in value of exports of processed products over the average of the previous three years are a deduction against taxable income).
- iii) There will no increase before December 1980 (except where the Government has agreed to a later date) in the royalty rate for logs processed. Any timber company which can justify that the rate of royalty which it pays is excessive relative to prevailing Papua New Guinea rates (as determined by the 'Royalty Appraisal System 1976') may, by application, have its royalty rate reviewed.

- iv) The Government is of the opinion that log exporters can afford to pay a 10% export tax on exported logs. This view was supported by the recent Consultant's report on royalty appraisal. It is therefore proposed that the ruling export tax on log exports will be increased to 10%. Given the state of the forest processing industry however this increase will not be imposed on processors who fulfil "the extent of processing required" as outlined in Section 3.5 below. This represents a further Government support for processing in terms of revenue forgone which is on top of the revenue forgone through lost export tax when logs are processed.

- v) The Government will contribute toward the technical and managerial training of Papua New Guinean employees in accordance with the Training Grants Scheme as proposed in Section 3.9 below.

- vi) Enterprises which have agreed to process within Papua New Guinea in accordance with Section 3.5 will not generally be required to undertake reforestation (Section 3.10).

- vii) The Government will modify its policies toward taking action either to recover damages from an enterprise or cancel the Permit or Licence of an enterprise in default of its processing obligations under the terms of its Agreement, Permit, or Licence with the Government. If agreed upon processing commitments are not followed:
 - a) the enterprise in default should not be eligible for the rebate of fifty per cent of the export duty on all logs exported; or
 - b) the Government shall direct the enterprise to reduce its log export allowance in proportion to the reduction from the original processing schedule, so that the original processing ratio is kept; or
 - c) in the event of a prolonged cessation of operations the Government shall cancel the Permit or Licence and recover such damages as may be awarded.

The decision on which of the above provisions will apply is at the discretion of the Government.

The Government will not impose any of the above provisions where they conflict with a Permit or Agreement condition not subject to review. However any timber operator may request changes to its existing Permit or Agreement in the light of the above provisions.

As a condition of altering any provision of the enterprises existing Timber Permit or Agreement (at the request of the enterprise), the Government may seek to renegotiate any provision of the Agreement or Permit. The Government's objective in such renegotiation will be to seek uniformity between Timber Permits and Agreements.

Any changes to existing Agreements or Permits shall be by mutual consent between the parties. An enterprise may elect to keep its existing Timber Permits or Agreement conditions intact.

Whether or not alterations are made to existing Agreements or Permits the Government will henceforth assume that all conditions are fair and reasonable, and it shall enforce all such conditions of all Agreements and Permits fully.

3.5 Guidelines for combined Log Export - Processing Operations

Undertaken by Foreign Enterprises

Foreign enterprises may, at the discretion of the Government, undertake projects which export logs provided that (as distinct from the guidelines of PART 2):-

- i) the project includes the establishment and operation of wood processing facilities in accordance with (a) to (d) below; or
- ii) the project includes other substantial investment (beside investment related to log exporting) complying with the Guidelines of PART 4 or
- iii) the undertaking involves only a limited and short term log export - road construction contract complying with the Guidelines of PART 5; and

- iv) the forest resources of the project area are suitable for a log export operation ((1) and (2) below).

The extent of processing required under (i) above will be negotiated on a case by case basis within the following guidelines:

- a) the proportion of the processing required will not be less than 30% of total log harvest;
- b) the proportion of required processing will be higher for operations which have good access to a domestic sawn timber market (e.g. Lae, Port Moresby, Rabaul) which is large relative to sawmill capacity;
- c) the proportion of required processing will be higher for operations based on a forest resource which has a high proportion of species which can be readily sold on export markets as sawn timber (Taun, Kwila, Pencil Cedar, Calophyllum etc.);
- d) the processing schedules will be negotiated at the outset, and will contain a provisional requirement for later expansion of processing capacity, subject to a profitability test. Similarly the terms of such expansion will be negotiated at the outset.

There will be no automatic 'right' to export logs, and in particular log exports will not be allowed in cases where in the view of the Government:

- (1) forest resources in the vicinity of current or prospective local markets are limited (e.g. Lae, Rabaul); or
- (2) the available resources in the area under consideration are too limited to sustain a long run commercial log export operation.

3.6 Infrastructure

It is the general rule that timber enterprises are responsible for the provision of infrastructure required in connection with its operations. Detailed obligations related to the provision of infrastructure, consistent with this general rule, are specified in each separate Timber Concession Agreement (or Timber Permit).

However the Government may in certain cases agree to an arrangement which will lower the enterprise's "front end" capital commitments to the project by the Government constructing (or having constructed) certain facilities to agreed specifications and charging investors for the use of such facilities at a rate which allows a reasonable return on the Government's investment. Such facilities could also be constructed in return for equity, subject to the type of considerations outlined in Part 3.7.

In situations where infrastructure required for a timber operation is of value for wider purposes of National or Provincial development and has been incorporated into firm National and Provincial plans, the Government may judge it to be in its interest to contribute to the financing of such infrastructure. Any infrastructure established by the investors will be made available to the public at large to the extent that this is compatible with the efficient conduct of the timber operations.

3.7 Equity

In the past the Government has sought to negotiate in all major concession agreements the option to purchase on favourable terms a standard 26% of equity at any time during the first five years of the project, and to retain an option to purchase a majority shareholding in the latter years of the project.

In future the Government will negotiate the purchase at par of equity in those timber projects which at project commencement appear to have good prospects of yielding high returns to Government shareholding. Each project will be evaluated and negotiated on its merits, consideration being given particular to the Government's ability to ensure profits are earned in Papua New Guinea (i.e. the Government will specifically consider the extent of arms length dealings). Long term equity options at market prices will be negotiated separately.

3.8 Papua New Guinean Associated Enterprises

Twenty-five percent (25%) of all timber royalties arising in respect of timber harvested from Timber Rights Purchase areas are paid to customary timber owners as payments for timber rights. In some timber areas this payment represents an important source of

potential savings and investment capital, and it will become increasingly important as total log harvest increases. By their very nature timber operations should provide opportunities for associated businesses as contract tree felling, log haulage, road construction, etc.

However, unless positive steps are taken to advise, assist and facilitate the formation of Papua New Guinean enterprises in timber areas the opportunity for greater participation in the timber industry will be missed and a potential source of savings will be lost.

The Government must take the leading role in advising and assisting with the formation of Papua New Guinean enterprises associated with timber operations. At the same time timber enterprises must also be obliged to encourage and facilitate in the formation of such enterprises.

Each newly negotiated (or reviewed) Timber Concession Agreement (or Timber Permit of 10 year term or longer) which involves a log harvest in excess of 40000 cubic metres per year will include requirements that the timber enterprise:

- i) adheres to a reasonable local business development programme (i.e. a time programme under which Papua New Guinean enterprises will be involved in tree felling, log extraction, supply of materials etc.); and
- ii) employs a suitably qualified business development officer to assist in and to liaise with the Government on all aspects of the local business development programme.

3.9 Training and Localisation

Training is a joint responsibility of the Timber Industry and the Government. The following measures are proposed:

- i) Priority will be given to the training of Papua New Guineans in all aspects of the timber enterprise - supervisory, technical, financial, marketing and managerial and to the localisation of positions within a reasonable period.

Each negotiated Timber Concession Agreement will include a requirement that the timber enterprise adheres to an approved training and localisation programme.

ii) Proposed Timber Industry Employees "Training Grants Scheme":

The Forest Industries Council of Papua New Guinea (FIC) has submitted a proposal for the running of high level in-company courses in senior management and technical aspects of the timber industry, including export timber grading. The Forest Industries Council currently employs an experienced sawn timber grader who will organise courses in his field. Additionally the Forest Industries Council proposes to engage, perhaps through overseas aid sources, a senior management adviser and a technical training officer.

The Forest Industries Council believes that the Government should encourage by way of a subsidy the training of Nationals engaged in the timber industry, and has suggested that a "Training Grants Scheme" be established. The Government supports the proposals for this Scheme, and within guidelines to be agreed upon with the Forest Industries Council the Government would contribute up to K15 per man per day for all Papua New Guinean personnel released by timber companies for training either in-service or externally. The Government grant towards the scheme would be on a four year trial basis, with a maximum of K30,000 per year.

If the Government judges the Scheme to be successful in contributing to the efficient localisation of technical, and managerial positions in the timber processing industry it may extend the Scheme to cover training in logging supervision. Having numbers of well trained logging supervisors will be crucial to the efficient operation of the proposed Papua New Guinean owned export logging enterprises proposed under PART 2.

3.10 Reforestation

The proposal to allow an increased volume of log exports (mainly by Papua New Guinea enterprises) will require an increased commitment by the Government on follow-up utilisation of land (for agricultural projects or reforestation) in areas logged. The procedures proposed to ensure this commitment have been outlined in Part 2. It is proposed that the Government will take a more active role in undertaking reforestation and that private timber companies will not generally be involved in reforestation. The following are the proposals in relation to the role of existing industry and new foreign enterprises with regard to reforestation:

- i) Subject to (ii) below, timber enterprises will not be obliged to undertake reforestation. Rather, reforestation projects will be undertaken in selected areas by the National and/or Provincial Governments.
- ii) Foreign enterprises may contract to carry out large scale reforestation in return for the right to export logs (Part 4). Ownership of the reforestation plantation will then vest in the National and/or the Provincial Governments and/or the customary landowners, according to the terms negotiated.
- iii) Foreign enterprises who request to undertake reforestation (as either part of a timber operation or as a separate project) will be encouraged to do so provided that:
 - a) a feasibility study shows the project to be technically sound and economically viable; and
 - b) sufficient suitable land is available; and
 - c) the enterprise has the managerial and financial capacity to properly implement the project; and
 - d) the project is in all aspects in the national interest.

3.11 Marketing

A timber processing enterprise which exports log will be required (in any newly negotiated revised Timber Concession Agreement or Permit) to agree to the provisions applying to the marketing of export logs outlined in Section 4.5.

3.12 Other Conditions and Guidelines

Other conditions and guidelines applicable to the timber processing enterprise are contained in PART 6.

PART 4: GUIDELINES FOR FOREIGN ENTERPRISES INVOLVED IN LOG EXPORTING, AND
NOT PROCESSING IN PAPUA NEW GUINEA

(LARGE SCALE OPERATIONS)

(GUIDELINES FOR LOG EXPORT-ROAD CONSTRUCTION CONTRACTS OF A
LIMITED SCALE ARE OUTLINED IN PART 5).

PART 4: GUIDELINES FOR FOREIGN ENTERPRISES INVOLVED IN LOG EXPORTING, AND
NOT PROCESSING IN PAPUA NEW GUINEA

(LARGE SCALE OPERATIONS)

4.1 Introduction

The Guidelines of Part 4 specify conditions under which a foreign enterprise may undertake a large log export operation not combined with a facility to process saw/veneer logs.

The essential difference between the nature of the project envisaged under Part 2 and the type of project relevant to Part 4 is on the basis that foreign investment will be promoted for log export operations which are combined with activities e.g. agro-industrial projects, woodchipping, that is, projects that require large amounts of capital or advanced technology not appropriate to Papua New Guinean owned enterprises.

4.2 The Type of Enterprise Promoted

The enterprise submitting a proposal which conforms to the guidelines of Part 4 should be able to demonstrate that it possesses managerial experience, financial capacity and marketing expertise necessary to undertake successfully all aspects of the proposed venture (i.e. the associated activities as well as the log exporting side).

In relation to the log exporting component the Government must be reasonably satisfied that logs will be sold at arms length or at arms length prices. Preference will be given to foreign enterprises which can demonstrate a record of selling to non-affiliated enterprises, a record of active promotion of wood products into diverse markets and a record of efficient operations in comparable conditions elsewhere.

The enterprise will be asked to supply details of:

- * Past experience and current commitments,
- * Affiliated companies,
- * Financial worth,
- * Principal officers and directors,
- * Major stockholders,

in accordance with the Government's "Guidelines for the Preparation of Forest Development Proposals".

4.3 Forest Areas Suitable for a Large Log Export Operation

Log export operations proposed under the guidelines of this section will be restricted to forest areas which in the view of the Government:-

- * comprise a resource of sufficient size to support the proposed log export operation until a reforestation plantation is ready for harvesting, or other follow-up development (which is to be an integral part of the proposed venture, see Section 4.4, is able to sustain economic activity in the area; and
- * because of an unfavourable species mix, is not suitable as a base for a processing operation; and
- * is not required to meet the needs of a domestic market in the vicinity.

These requirements are additional to those outlined under Section 3.3.

4.4 Specifications for an Acceptable Log Export Operation

Foreign enterprises involved in large scale log export ventures and not conforming to the processing requirements of Section 3.5 will, in conjunction with log exporting, be required to undertake an activity which:-

- i) intergrates well with a logging operation; and
- ii) will sustain economic activity in the timber area on a permanent basis; and
- iii) together with logging requires a total investment of at least K5 million; and
- iv) is included as a priority or open activity in the National Investment Priorities Schedule; and
- v) otherwise conforms to the policies of the National Government and the Provincial Government concerned.

Suitable associated activities with a logging operation would include one or a combination of:-

- * a large agricultural project
- * a large scale agro-industrial venture
- * a large reforestation project for the production of high quality saw-veneer logs.
- * a large pulpwood reforestation project
- * a woodchipping facility.

Approved enterprises will be those which, in the opinion of the Government, provide national benefits at least as great (net present value) as an alternative Papua New Guinean log exporting enterprise.

4.5 Marketing

The following measures are proposed in order to ensure that both the short-term revenue benefits and the long term benefit of establishing a market base for the sale of processed wood products are obtained from the log export programme.

A. Promotion and Sale of logs by the State Marketing Agent.

In all new or reviewed timber permits which include a log export entitlement a condition will be included along these lines: "In order to fulfil market contracts arranged by the State or a marketing agent appointed by the State for the purposes of:

- i) promoting the use of Papua New Guinea's lesser known (but widely represented) species,
- ii) diversifying markets for Papua New Guinea's forest product exports,
- iii) selling directly to end-users rather than through intermediaries,

the log exporting enterprise will at the request of the State sell logs to the State, or a marketing agent appointed by the State, or direct to the contracted purchasers, at prices and on terms specified by the State (or its agent) provided that:

- a) the enterprise shall be given reasonable notice of the intended purchase;
- b) no order will (without the agreement of the Company) exceed 25% of the enterprise's log export allowance over the period during which the order is to be filled;
- c) the processing operations of the enterprises will not be disrupted;
- d) the enterprise's existing export commitments are not thereby unduly delayed or unduly disrupted;
- e) the price for logs paid by the State (or its agent) to the enterprise shall be no less than the contract price arranged with the purchaser less any reasonable handling charges and less any reasonable marketing agency fees".

This measure is necessary because it is often too inconvenient or too costly for an individual company to arrange sales into new markets, or sales of certain species, except as mixed species shipments. The objectives of promoting lesser known species and diversifying markets, and the longer term objective of forming a market base for the sale of processed forest products (by establishing clear user preferences), will not be met unless there is some direct selling of logs by a 'Central Marketing Authority' (marketing agent) acting in the longer term interest of Papua New Guinea and its timber industry.

It is intended that a marketing agent created by the State will be the body that acts as the 'marketing agent' for this purpose.

B. Other measures to protect log export revenues

A series of additional measures will be taken to ensure that Papua New Guinea receives a fair price for all logs exported:

- i) the rate of growth in the volume of log export will be strictly controlled by setting national priorities for the allocation of Timber Permits and log export quotas. The majority of Papua New Guinea's species are not well known on export markets. Too rapid an increase in the

volume of logs exported will result in a decrease in log price. The only beneficiaries of unco-ordinated competition between Provinces for the commencement of log export operations will be the overseas log buying countries.

- ii) 'Minimum guidelines prices' for log exports will continue to be imposed under the Exports (Control and Valuation) Act. A marketing officer to be appointed within the Office of Forests under an approved N.P.E.P. project will work closely with the Department of Foreign Affairs and Trade and the Forest Industries Council in order to determine fair guideline prices.
- iii) Marketing agreements or arrangements covering the sale of logs for all firms exporting logs will be subject to Government approval. Approval will not be given for any agreement or arrangement which inhibits the sale of logs at competitive prices, e.g. where an overseas log buyer attempts to monopolise a logging company's sales by providing loan finance in return for sole right of purchase.

C. Co-operation and co-ordination to promote domestic timber sales

The increased domestic use of Papua New Guinea timbers should not be at the cost of substantial increases in the cost of housing, other buildings, or furniture. Steps taken to substitute timber for imported materials should rely on such measures as the design of buildings most appropriate to Papua New Guinea, reducing production costs by increased utilisation and recovery (e.g. by greater use of 'residual' species and 'falldown' sizes), decreasing distribution costs by co-ordination in transport, increased sawmill capacity utilisation by long term purchase contracts, and information on likely future sawn timber demand, rather than on increased tariffs, import quotas or other measures that substantially increase costs to the user.

These measures will require increase co-operation and co-ordination between those involved in the production, distribution and use of timber products.

A small permanent group will be set up in order to assist in co-ordinating research, building design, and government policy in this area. This group will have members drawn from the Office of Forests, the Forest Industries Council, the Housing Commission, and the Department of Works and Supply.

Further, it is considered that all proposed government department and government authority tenders for building materials and furniture should be submitted to the Forest Industries Council for comment and advice before final release.

4.6 Log Export Taxes

It is proposed that log export taxes will be increased to 10% of f.o.b. value for all operations not meeting the processing guidelines specified in Section 3.5 (See also Section 3.4).

The royalty rate will be that given by the Papua New Guinea Royalty Appraisal System 1976, and will apply until December 1980.

4.7 Damages

As the right to export logs will relate largely to an obligation to undertake a substantial associated project (as outlined in Section 4.4), failure to complete that project in accordance with negotiated specifications and timetable will usually incur a curtailment in allowable log exports. However where it is more appropriate monetary damages may be imposed.

4.8 Other Conditions

In respect of all other relevant matters particularly:

- * Infrastructure
- * Equity
- * Papua New Guinean Association Enterprises
- * Training and Localisation.

the conditions covering processing operations of Part 3 will apply as well to large scale log exporting enterprises.

4.9 Joint Ventures

In certain instances the Government may approve a joint-venture log exporting venture which has some of the characteristics of the type of enterprise envisaged under Part 2 but which involves a foreign shareholder (who would hold a minority shareholding).

This type of venture would be applicable to a foreign enterprise which:-

- i) has a good international reputation for efficient management and active marketing associated with tropical hardwood operations,
- ii) can demonstrate that it deals at arms length and will continue to deal at arm length, particularly in relation to the sale of logs,
- iii) would in other respects act as the management agent for the purposes outline in Section 2.2 (iv), besides being an active shareholder in the enterprise.

PART 5: GUIDELINES APPROPRIATE TO FOREIGN ENTERPRISES INVOLVED IN LIMITED
LOG EXPORT - ROAD CONSTRUCTION CONTRACTS

PART 5: GUIDELINES APPROPRIATE TO FOREIGN ENTERPRISES INVOLVED IN LIMITED
LOG EXPORT - ROAD CONSTRUCTION CONTRACTS

5.1 Introduction

The guidelines of PART 5 are intended to apply to log export projects of a limited size and for a limited term which involve a contract to construct priority roads in return for the right to export a specified quantity of logs.

5.2 The Type of Enterprise Promoted

Log Export - road construction contracts being of a limited size and requiring only a short term Timber Permit will normally be tendered on the basis that:

- i) the Enterprise should be able to demonstrate from its past performance, and on current management and financial capacity, that it is capable of building the required road to the design standards required and within the timetable proposed
- ii) subject to (i) the Enterprise that tenders the lowest volume of export logs required in order to comply with all contract provisions will be selected.
- iii) in instances where an existing timber Enterprise which satisfies (i) above and has a clear strategic advantage to undertake a particular road construction contract (e.g. where a priority road is within or adjacent to an existing Concession Area) the Government may negotiate directly with that Enterprise alone.

5.3 Forest Areas and Projects Suitable for Log Export - Road Construction Contracts

In addition to the relevant matters indicated in Section 3.3 log export - road construction projects will be confined to instances where:

- * the proposed road is of clear priority and of significant National or Provincial benefit i.e. it is not proposed that log exports shall be used as a means of having constructed a road which would otherwise would not be approved because it is of insufficient national benefit;
- * the road would not otherwise be constructed as a normal part of the timber operation, or within the time period required;
- * the road would not be constructed at less cost or more efficiently under a normal road construction contract;
- * the forest resource can sustain the amount of logging required using the criteria of Section 4.3.

5.4 Basic Conditions of an Acceptable Log Export Road Construction Contract

General conditions that will be appropriate to a log export-road construction contract are as follows:-

- i) The term of the Timber Permit will normally be less than 5 years;
- ii) The export tax on logs will be 10% of f.o.b. value and royalties will be those determined under the Papua New Guinea Royalty Appraisal System 1976 (To be reviewed after December 1980).
- iii) No specific conditions will normally be included, in relation to equity, infrastructure establishment, associated Papua New Guinean business development, or a training and localisation programme, except those required under any Law or those contained in any separate Agreement to which the Enterprise may be party. (e.g. in a case where the Enterprise holds a Concession Agreement under the provisions of PARTS 3 or 4 and is to undertake a separate log export - road construction contract in accordance with the conditions of this part (PART 5)).

- iv) Other Standard Timber Permit conditions will apply (forest working plans, log measurement, etc)
- v) Each log export - road construction contract will clearly specify that the Enterprise has no exclusive right or any other prior right to the grant of any subsequent Timber Permit over the area logged as part of the contract i.e. it is intended that the log export - road construction contract will be quite separate from the allocation of any remaining concession as a basis for a larger project, in cases where substantial resources remain in the area after the completion of the contract.

5.5 Log Export Entitlement

The log export allowance, whether determined by tender or by negotiation will, as with the Guidelines of other PARTS, aim at providing a fair return to investment committed to road construction and logging. The allowance will be on the basis that an initial fixed log quota will be granted in order to facilitate the commencement of logging and road construction, and an additional log quota will be granted for each kilometre of road completed and approved (after Government inspection) as complying with the specified design standards.

As the log export quota will be on the basis that roads will be first constructed, "damages" provisions of a type that may be necessary for operations according to PARTS 3 and 4 may not be required.

PART 6: ASPECTS OF NATIONAL FOREST POLICY

PART 6: ASPECTS OF NATIONAL FOREST POLICY

6.1 Introduction

The main concern of this Policy Revision has been to specify Investment Guidelines which are consistent with the overall objectives of Government. The statement of objectives and the developmental emphasis has been the concern of PART 1. The more detailed investment guidelines have been outlined in PARTS 2 to 5. This final part (PART 6) briefly notes those main aspects of Forest Policy which establish the framework in which forest development investment occurs. It notes the directions proposed for Government expenditure, effort and attention in order that these are consistent with National objectives. The notes are intended also to indicate the relationship between the various guidelines of PARTS 2 to 5 and the overall objectives of Government.

6.2 Forest Legislation

Existing forestry legislation is in many respects obsolete, technically inadequate or inappropriate to deal effectively with the allocation and management of forest resources in an Independent Papua New Guinea: A revised National Forest Act to replace the:

The Forestry Act (Amalgamated) 1973

The Forestry (Private Dealings) Act 1971

will be presented to Parliament in 1979-80.

6.3 Development Priorities and the Allocation of Concession Areas

The emphasis of investment for new development over the next few years will be quite clearly on the formation of Papua New Guinean owned timber operations in accordance with a sound forest development programme and clear national priorities. Unless the allocation of concessions and the rate of increase in log exports are strictly controlled this policy will benefit neither individual areas nor the nation.

It is intended that the Minister for Forests will exercise his powers and obligations to ensure the orderly exploitation and replacement of the nation's forests by stressing the need for co-operation between the National and Provincial Governments.

This can only be done if the National and Provincial Governments understand each other's objectives and limitations.

In order to facilitate an orderly programme the Minister will release a draft "Forest Development Plan" and will invite Provincial Government comment thereon before determining 'final' forest development priorities. It is clear also that Provincial Government advice must be sought on the basis for negotiations over the allocation of future concession areas and that the Provincial Government must be represented at negotiations.

Generally speaking, the resource base for new forest developments over the next few years will be areas over which Timber Rights have been acquired. In order to ensure an orderly initial development programme it is proposed that no further large Local Forest Areas be considered during this period beyond those already under consideration.

During this period forest legislation will be revised (6.2 above). Desirable aspects of the Forestry (Private Dealings) Act will be incorporated within a single Forestry Act, and existing inconsistencies between the two current sets of forestry legislation will be removed. Some other aspects of the 'Private Dealings Act' will be amended:

- To provide for greater direct control and monitoring of Local Forest Area operations e.g. to prevent exploitative logging and to allow forest environmental controls to be enforced.
- To prevent log buyers from exercising control over the marketing of logs from Local Forest Areas.
- To allow greater control over the level of timber royalties, the measurement of logs and the payment of royalties.
- To limit the size of resources subject to Private Dealings.

6.4 National Ownership of Forest Development Projects

The Government's concern with increasing the proportion of Papua New Guinean ownership in the timber industry is indicated by the emphasis that will be given to the formation of Papua New Guinea enterprises under the guidelines of PART 1, to the creation of Papua New Guinean businesses in association with large foreign timber enterprises and, to a lesser extent, to the purchase of government equity in foreign timber enterprises.

It is intended that the Office of Forests and the Department of Commerce (Business Development) in particular will cooperate very closely to assist the people of forest areas and Provincial Governments to participate as shareholders in the nation's timber industry.

6.5 Integration of Forestry and Agricultural Aspects of Rural Development

It is proposed to integrate forestry and agricultural administration and operations more fully as these are clearly two closely related aspects of the single problem of rural development.

This will require a greater emphasis on integrated land-use planning. The land-use planning group to be formed for this purpose (Section 2.2 (E)) will have the responsibility of advising and assisting Provincial Governments and (in consultation with Provincial Governments and other National Government Departments) coordinating all aspects of national land based projects associated with logging including: land-use assessment, economic feasibility studies, recommendations for land acquisition, proposals for funding land-use projects and the monitoring of follow-up development of forest areas.

6.6 Land Acquisition

As is noted in PART 1 the ability to obtain access to suitable underutilised land is fundamental to sound long term forest management. This will be a basic consideration in the proposed revised National Forest Act mentioned in Section 6.2. Until appropriate legislation is formulated and approved which gives

force to the principle enshrined in the Constitution (to replenish natural resources for the benefit of future generations) the procedure outlined in PART 1 and PART 2 (Section 2) will be followed.

Briefly this envisages cooperation between the people of forest areas, the relevant Provincial Government and the National Government in making available and utilising properly land in areas logged.

It requires also that the National Government will defer the allocation of forest concessions where satisfactory follow-up land use cannot be guaranteed through inability to gain access to land.

6.7 Timber Acquisition and Exploitation

Existing legislation provides for the exploitation of forests (for other than customary usage) in three ways:

- i) Timber Rights Purchase
- ii) Native Timber Authorities
- iii) Agreements under the Forest (Private Dealings) Act 1971

The proposed review of forest legislation (Sections 6.2, 6.3 and 6.6) will aim at removing inadequacies and inconsistencies in the above procedures in order that the revised procedures are more appropriate to the current Papua New Guinea context, particularly taking into account certain conflicting needs and realities; the complex nature of customary timber and land ownership and the need to simplify (and lower the costs of) timber purchase procedures; the environment, and at the same time establish a secure resource base for a forest industry; the need to recognise the distinction between 'land' and 'timber' and at the same time ensure that resources can be replaced or other conservation practices adopted in conjunction with forest exploitation where this is essential to sound forest management; the need to obtain access to a sizable resource base for a developing industry. At the same time the acquisition of timber rights of a particular forest area, which can raise the expectations of the timber owners concerned, should not be undertaken unless there are prospects for the development of the resource.

6.8 Environmental Protection

It is proposed to implement industrial environmental and forest environmental protection measures in the form of Agreement provisions such as have been included in recent Concession Agreements (as amended by any subsequent Environmental Legislation approved by Parliament and tailored to the characteristics and needs of each particular forest area). The main change in emphasis on environmental control will be to specify 'ground rules' for the protection of the forest environment with as much detail as is feasible prior to the issue of a Timber Permit.

Through the relevant Provincial Government, prospective environmental protection measures will be explained to representatives of the people of forest areas, and as well comments will be sought, so that the implications of timber operations can be more clearly understood by these people and their views taken into account.

This procedure will require a Forest Working Plan being approved by both the National Government and the Provincial Government concerned prior to the commencement of logging.

The working plan will demark areas to be excluded from logging including all areas of cultural and traditional importance as hunting areas, streams, village reserves, gardening areas, sacred areas, etc.

6.9 Reforestation

It is proposed that the National Government will play a more active role in evaluating and undertaking reforestation projects at carefully selected sites throughout Papua New Guinea.

Reforestation projects will be submitted for funding under the National Public Expenditure Plan, following a land-use evaluation and economic feasibility study along the line proposed in Section 2.2 (E).

The main objective of the National Government reforestation programme will be to undertake a limited number of large economically viable reforestation projects at sites where sufficient areas of productive (but underutilised) land are available and reasonably close to harbours suitable for overseas shipping. These plantations will be designed to produce forest products likely to be demanded by overseas markets at the time the plantations are ready for harvest.

It is proposed that private timber enterprises will not be required to undertake reforestation unless this is a condition of a log export operation of the type proposed under PART 4, in which case the log exporter will act as a 'contractor' to establish a plantation which will be owned by the National Government.

In addition to these large National Forest Plantations there will be several smaller plantations established aimed at supplying wood to domestic markets, such as Mt. Hagen, where resources in the vicinity of such a local market have been depleted. This type of plantation will normally be undertaken by the Provincial Government.

The rationale for the type of reforestation programme proposed is that Papua New Guinea will remain as a net exporter of forest products (except at a few resource short locations) for the foreseeable future. Reforestation programmes should take into account the significant economies of scale (particularly in relation to future processing and marketing) of reforestation projects directed at export markets.

It will be neither feasible nor advisable to have a large reforestation project in each Province, given the availability of financial resources, the limited number of potential sites, and alternative land-use possibilities. It is proposed therefore that it should be the National Government's responsibility to ensure, with the cooperation of the customary landowners and the Provincial Governments, that a wise reforestation programme providing for the needs of future generations is undertaken. Further, reforestation projects are not normally suitable to foreign equity financing

because of the very long time periods involved, the simple technology required and the type of resources employed (largely labour and land). For this reason timber enterprises will not be required to undertake reforestation directly, but part of the revenue generated by forest exploitation will be reinvested by the Government in resource replacement.

6.10 Extension

Even with a rapid expansion in forestry development the number of people actually affected or benefiting from large forestry projects will be a very small proportion of the majority of the population in rural areas. For this reason the emphasis of this document on industrial forestry must be regarded as only a part of government forestry activity. Rural extension programmes must be gradually strengthened, requiring closer integration of agricultural and forestry extension activities - as advice on agro-forestry projects, on the distribution of fruit trees from existing forestry nurseries, and on village tree farming in resource deficient areas.

6.11 Small Scale Industry

The Government will ensure that an adequate advisory service will be available to small scale industry operations.

Small sawmills traditionally operate with little technical back-up to maintain them. A need for a readily available advisory service covering all aspects of small scale sawmilling is recognised. To some extent sections of this need will be catered for by the training of Nationals at the new Timber Industry Training Centre located in Lae. Additionally the National Government will seek suitable advisors to train both operators and operator-trainers so that an extension to small millers can be maintained indefinitely.

Similarly, the Forest Products Research Centre will continue to disseminate information on wood preservation, timber identification, marketing and advice on specific end uses for timber. The Centre will also give advice on the collection and marketing of a whole range of minor forest products as dammar gum, copal gum, rattan cane, cinnamon oil and sandalwood.

6.12 Foreign Investment Policy

The proposed foreign investment policy in the forest sector is implied by the "Investment Guidelines" of Parts 2-5. Briefly, it is recognised that direct foreign investment in the forest sector will be required for many years yet if there is to be a reasonable rate of forestry development. However, this investment should be very selectively promoted in relation to the calibre of the foreign enterprise, the sources of investment capital (in order to diversify the country of origin of foreign investment in the forestry industry), and the type of timber enterprise to which foreign investment is directed, so that foreign investment complements investment undertaken by Papua New Guinean enterprises. Foreign investment should be directed to the more capital intensive higher technology projects, and projects dependant on an overseas marketing/managerial network.

Foreign investment policy in the forest industry sector must be consistent with overall Government policies particularly with the policies of the National Investment and Development Authority and its National Investment Priorities Schedule. Consequently this document will be updated constantly.

6.13 Royalties and Other Charges

The fixing of royalties should be based on a fair "return criteria" as in policies relating to mining royalties. Levies should be reviewed when there are fundamental and apparantly long term changes in industry cost/price structure. It is recognized that too frequent reviews will lead to instability from the viewpoint of the investor. Hence it is suggested that royalty review will be deferred to the end of 1980, while a review of export taxes on logs will not be undertaken for several years following the proposed increase to ten per cent f.o.b. value.

6.14 Marketing

As noted elsewhere, an expanded programme of log exports will require more active market promotion and some direct selling of logs by the Government in order to:

- a) diversify overseas markets into where Papua New Guinea forest products can be exported,

- b) promote lesser known but widely represented species.

- Note: i) Emphasis on the role of a marketing agent created by the State
ii) Recruitment of a Forest Marketing Officer
iii) Conditions of Section 4.5.

6.15 Control and Monitoring

Emphasis of policy on existing industry will be:

- * Some relaxation of log export conditions, and incentives for processing
- * More uniform Permit conditions
- * and more rigid and consistent enforcement of reviewed conditions

Only if conditions are practical and economically rational can they be imposed. "Damages" only to be included when intent to recover, hence vary damage provisions but recover those that are due.

6.16 Training

- (a) Papua New Guinea Forestry College: The College at Bulolo will continue to offer a three year diploma course with an adequate intake for expected needs.

The course is designed to provide practical middle level forest managers. At least two thirds of the graduates will find career employment in the Office of Forests, the remainder join bodies such as the National Parks Board, the Wildlife Section in the Department of Lands and Environment and private companies in the timber industry. The College also runs refresher courses for upgrading forestry officers and specialised courses as the need arises.

- b) Timber Industry Training Centre: The recently completed Centre in Lae will provide trade training in all aspects related to the diverse forest industry. As well as training, consultancy services will be offered which are designed to

assist all levels of sawmilling and remanufacturing operations. The Training Centre will cooperate closely with the forest industry so that courses can be tailored to meet specific industry needs.

- c) University of Technology, Lae: A four year degree course is offered at the University for professional forestry training. The course contains a strong core of science subject designed to produce forestry managers, planners and researchers. An annual intake of ten to twelve students is currently planned.
- d) Training Grants Scheme: The Government proposes to introduce a "Management and Technical Training Scheme" in association with the Forest Industries Council. The Scheme will be designed to enhance effective localisation of managerial and technical positions within the timber industry. The Government will subsidize the training of Papua New Guinean staff released by timber enterprises and attending courses arranged by the Forest Industries Council.

6.17 Research

- a) The Forest Management Research Branch will continue its activities in four broad areas: silviculture, protection, environmental protection, and agro-forestry.

Silvicultural research will be primarily aimed at selecting suitable fast growing species for lowland rainforest reforestation and improving the performance of these species through tree breeding and developing better management techniques.

Pathological, entomological and fire research will continue to identify forest pests and diseases, and develop appropriate control methods to reduce losses in plantations.

Environmental research will continue to monitor the effects of large scale logging on the physical environment and advise on ways of reducing undesirable impacts.

Research on cattle grazing under plantations, and into the production of edible mushrooms will continue to help agro-forestry projects expand throughout Papua New Guinea.

- b) The Forest Products Research Centre (FPRC) will continue its activities aimed at determining optimum methods for conversion, utilization and marketing of forest products and minor forest products. Research will be carried out in the fields of wood preservation, low cost furniture design and construction, pulp and paper making, properties of local timbers (in association with Australia's CSIRO), sawmilling practices and wood seasoning.

Research into charcoal manufacture, utilisation of waste wood as an energy source and as a chemical feedstock and the extraction and utilisation of starch from sago palms and sugar/alcohol from Nipa palms will be expanded.

Forest Products Research Centre has recently established a commercial division in order to ascertain the viability of industrial production of certain wood products. Such components as laminated beams and blockboard will be produced and introduced locally to test their suitability and marketability.

The Commercial Division will use waste wood boilers for kiln drying and carry out pilot and full scale tests of charcoal kilns and wood pyrolysis plants.

6:18 Decentralisation: The Role of National and Provincial Governments in Forestry

The forest development policy of any one Province should not compete with that of any other Province, but should complement each other's policy, with each forming a necessary part of the National Forest Policy.

A Provincial Forest Development Plan will be written with assistance from National Authorities within one year from 1/7/79. When accepted by the individual Provinces and the National Forest

Ministry, the Plan will be binding on all parties. The Plan may be altered by one party with the consent of the others, and may be reviewed annually in joint consultation carried out in good faith.

The Provincial Forest Development Plan will establish a priority order of area development acceptable to all parties, and the Plan will form part of the National Forest Development Programme proposed by the Minister responsible for forestry matters.

6.19 Log Export Policy

The Investment Guidelines of PARTS 2 to 5 indicate a substantial departure from the existing and very firm restrictions on the export of logs from Papua New Guinea in policy if not in practice. It will be firm policy to allow the increased export of logs with the objectives of:-

- * Increasing the rate of development in the forest sector.
- * Increasing Papua New Guinean ownership in the timber industry.
- * Increasing National Government revenues, Provincial Government revenues and incomes to the people of forest areas.
- * Increasing employment in rural areas.
- * Establishing a market base for the future export of processed wood products.
- * Ensuring social stability in logging areas.

There are many interrelated and essential components of a sound policy on log exports. It is necessary to:-

- * Establish fair priorities for development and a firmly imposed total log export programme (ceilings).
- * Give priority to Papua New Guinean ownership.
- * Ensure that Papua New Guinean shareholding is broadly based.
- * Specify clearly and rationally the forest areas from which log exports are, and are not, permitted.

- * Ensure efficient, commercial log export operations.
- * Facilitate and ensure follow up land use in areas logged.
- * Impose reasonable export taxes (or reasonable total "resource taxes").
- * Ensure a fair log export price in the short term by preventing transfer pricing and encouraging arms length dealings.
- * Promote and sell lesser known but widely represented species.
- * Diversify markets into where logs are sold.
- * Clarify the basis for interests in common and potential conflicts of interests in relation to Papua New Guinea's dealings with other log suppliers (e.g. SEALPA).
- * Diversify sources of foreign investment in log export projects.
- * Provide a framework for rational economic decision making consistent with the national interest where processing and log exports are joint components of a project.
- * Combine an increased rate of exploitation with a more active role of Government in reforestation.

The investment Guidelines of PARTS 2 to 5, at various points, are directed at meeting these basic requirements.

Ⅱ パプア・ニューギニア森林研究計画

長期調査員報告

昭和62年10月26日～12月5日

1. 長期調査員の派遣

1-1 調査の目的

本調査は、PNG森林研究計画に係る技術協力プロジェクトの事前調査（昭和62年5月31日～6月13日）の結果及び森林研究所設立に対する我が国の無償資金協力の進行状況を踏えて、PNGの森林研究組織拡充整備計画の中における我が国の協力の位置付け、プロジェクトの枠組み、PNG側実施体制の詳細を調査し、実施協議の際の具体的な資料を提供することを目的に行われた。

1-2 調査業務のT/R

本調査業務のT/Rは以下のとおりである。

- 1) 林業をめぐる一般事情
 - ・林業・林産業の現状と動向、産業界での地位
 - ・研究機関と産業界との連けいの現状
 - ・林業教育の現状と就業状況
- 2) 新設森林研究所の組織と業務概要
- 3) PNG側のプロジェクトへの準備状況
 - ・予算
 - ・人員配置計画
 - ・移転計画
- 4) 新設森林研究所に設置される、各研究室の研究業務の現状と動向
——各研究室設置の背景
- 5) 新設森林研究所の年次研究計画の目標と研究項目（案）の設定
- 6) 全体研究計画において、技協プロジェクトで取り上げるべき研究項目の設定及び年次研究計画
- 7) 研究計画と機材
 - ・研究所としての必要機材
 - ・上記のうち無償資金協力により供与する機材
 - ・技協により供与する機材の年次計画と機材仕様
- 8) 年次専門家派遣計画（案）の作成
- 9) 研修員の受入分野
- 10) TITCの活動現況と関係の様態
- 11) プロジェクト実施上の問題点
- 12) 専門家の生活環境と留意点