

8. 試験造林事業の評価

8-1 PNG の開発政策の観点からの評価

SBLCの試験造林事業は、1981～1983年に4樹種の植栽をほぼ計画通り完了し、以降の試験項目別試験成果により、用材林としての適正樹種の選定、植栽技術等を開発しつつ、現在までに試験的造林地を含めれば、約5,000haの造林を実施している。

PNG 国内における現在までの人工造林は、林業省16,840ha、州政府12,090ha、民間会社11,900ha、計40,830haにすぎない(表8-1)。樹種は多岐に亘っており、国、州の造林成績についての分析・評価はほとんど行われていない。今回西ニューブリテン州林業部局及びDAMI営林署を訪問したが、州が解析した資料はなかった。

PNG 政府の国家開発戦略では、非鉱業部門である再生産可能な農業、漁業、林業については、環境に配慮しつつ生産を拡大し、本部門により国の経済成長を維持発展させることを重要な戦略としている。林業省では来年度から新林業政策を実施することになっているが、天然林の伐採による資源の減少を極力回避するため、生産性の高い造林の拡大を政策の一つの柱としている。

しかし現状では、造林技術は一部パルプ用材を除いてはほとんど確立されていない。政府は熱帯林業行動計画に添って、天然林の資源保全と持続的林業の展開を図るべく、先進諸国の協力を要請中であるが、造林事業についての行動計画は策定されるまでに至っていない。林業省は「この点が不満で、今後強化する」と言明していた。

このような状況のなかで、SBLC試験造林事業は、前章に記述した通り相当の成果をあげ、適正樹種の判断の基礎となる成長量データについて林業省、州林業局、大学等の研究機関に公表し、造林技術開発について先駆的な役割を果たしていると高く評価されよう。

更に試験造林は、数年後に主伐期に入る予定で、主伐期の数量及び材質が明確になれば、基礎的な造林技術体系が順次開発され国及び州政府の造林政策に反映されることは十分予想される(現在の成長量からみてエリマは15年程度の伐期も期待できる)。

試験造林事業を地域開発政策面から考えてみる。試験造林地周辺地域は、国の農業政策の一環としてオイルパームのモノカルチャー的な生産拡大が行われて一応の成果を上げている。ちなみにSBLCの伐採跡地及び周辺地区には既にプランテーション15,250ha、入植者及び地域農民保有地16,250haが開発されている。オイルパームの買取価格はオイルの国際市況によって大幅に変動があり(現在ton当り26キナ、好況時80～100キナ)、特に2～4haの小農民の経営は必ずしも安定していない。

今回の周辺住民に対する調査表に基づく面接調査でSBLCの方式による造林を希望する者が多数あったこと、州政府では1987年よりダミ営業署で生産したカメレレの苗木をアグロフォレストリー用(カメレレの間作にココア、甘藷等を作付する)として、農民28人に各1ha分づつを無償配布した実績(州林業局担当官談)のあることから、試験造林の成果は州の地域

表 8-1 PNG 人工造林実施状況

PLANTATION ESTABLISHMENT - TO END OF 1990*

PROVINCE	PROJECT	MAIN SPECIES**	AREA IN HECTARES	
(1) National Department of Forests				
Morobe	Bulolo/Wau	3	13,000	
Milne Bay	Ulabo	1, 5, 6	800	
Madang	North Coast	1, 6	220	
Madang	Gogol Valley	1	1,400	
New Ireland	Kaut	1, 6	220	
Central Western	Kuriva	2	200	
Highlands Southern	Waghi Swamp	7	600	
Highlands Eastern	Ororo/Kulubaino	4	200	
Highlands	Fayantina	4	200	16,840
(2) Provincial Departments				
Morobe	Leron	4	50	
East New Britain	Keravat	1, 2, 5	1,800	
	Open Bay	1, 5	250	
Central Western	Kuriva	2	490	
Highlands Western	Lapegu/Nompia/Yonki	4	6,000	
Highlands Southern	Waghi Swamp	7	2,500	
Highlands	Mendi	4	700	
New Ireland	Namatani	6	50	
Simbu	Various	4	150	
Enga	Sirunki	4	100	12,090
(3) Private Companies				
East New Britain	Open Bay Timber Co.	1, 6	3,100	
West New Britain	Stettin Bay Lumber Co.	1, 6	3,500	
Madang	GRC/Jant	1	5,000	
East New Britain	Ulamona	1	300	11,900
TOTAL			40,830	

* Provisional

** Species codes: 1 Eucalyptus deglupta, 2 Tectona grandis, 3 Araucaria spp,
4 Pinus spp, 5 Terminalia brassii, 6 others,
7 Eucalyptus grandis and Eucalyptus robusta

出所: 林業省

注: 本資料は林業省が公表しているものであるが、西ニューブリテン州の造林(カメレレ、チーク等)約120ha及びSBLCの造林樹種面積が相違していること等から、本資料の精度は高いものではないが、参考資料として掲げた。

開発政策へ逐次反映されるものと考えられる。しかし州政府では、来年から実施される国の新林業政策がどのように展開されるか、国が住民造林をどのように取扱うか現時点では不明であり、州としてアグロフォレストリー方式による造林を推進するか、現在のところ決定しかねている。いずれにしても地域産業開発政策として造林の拡大に同社の試験造林の成果が活用される可能性はある。

8-2 環境政策の観点からの評価

PNG は1978年環境法 (Environment Planning Act) を制定し、同法に基づく環境ガイドラインは1985年に改正され現在に至っている。

現行の環境法によれば、環境保全大臣はプロジェクトの提案者に対し必要と認めたときはプロジェクトの環境計画の提出を求めることが出来ることになっている。

環境ガイドラインは、各プロジェクト共通のもので、分野別のものではない。現在環境保全省の林業担当部門では、林業開発プロジェクトに対するガイドラインを策定済みであり、来年度の新林業政策の実施時期に合わせ発効すべく準備中である。この案の概要は次の通りである(別添3ガイドライン案参照)。

1章 要約

2章 環境計画

1. 開発事業の目的
2. 開発事業の実行可能性
3. 開発事業の実施計画
4. 開発事業の進行計画
5. 社会・経済的環境の現況
6. 社会・経済的環境影響とその緩和措置
7. 生態学的環境の現況
8. 生態学的環境影響と環境緩和方法
9. 将来の検討事項
10. 環境モニタリングと環境管理

本ガイドライン案は従来の一般ガイドラインよりも各項目とも林業開発事業に必要な環境管理事項を詳細に規定している。この運用がどのようになるか現在のところ不明であるが、来年度より実施される予定の新林業政策には林業開発事業の環境的配慮の強化が含まれ、環境保全省担当官によれば、今後開発事業者に環境計画の提出が義務付けられる予定とのことであった。

SBLCは UNITECH付属のコンサルタント会社に委嘱して、環境ガイドラインに添った詳細な環境調査を実施し、環境計画書を作製して環境庁の承認を受けている。環境保全省林業担当官によれば、提出された環境調査及び計画書は現在、案の段階であるガイドラインにも即しており、また林業開発事業を行っている企業で環境調査及び環境計画を提出したものは現在まで同社のみであるとしてこれを高く評価していた。

SBLCは本年6月環境対策専門課を設置して、全職員に環境配慮のための各作業別の留意事項を記載したマニュアル「MANUAL ON ENVIRONMENT PROTECTION MEASURES」（図入り39ページ別添付4参照）を配布し、従業員教育を充実すると共に、専任職員による現地巡回を行っている。また、造林地10箇所（1988, 89, 90年植栽地1箇所 250㎡）、天然林択伐跡地6箇所（1989, 90年択伐地1箇所 1ha）、天然林未伐採地2箇所（1箇所 400㎡）を設定し、環境変化の計測を行っている。計測は主として地域内立木の成長量、土壌侵蝕、土壌固化の状況であり、生態系については現在のところ UNITECHに依存している。この計測は、造林地については林相の変化、天然林については択伐後の林相回復状況を計測することを目的としている。

同課では伐採、植栽に伴う社会的環境を保全するため、事業実施前に周辺住民の利用している地域、及び立木について調査してこれらを残置するための標示業務と住民からの苦情についての実態調査を担当している。住民からの苦情件数は少ないが、残置すべき立木の誤伐、河川沿いの伐採禁止地帯（両岸から50m幅）の誤伐及び機械の誤操作による侵入等が寄せられた。また、試験造林地については現在まで苦情はないとのことであった（環境担当スタッフ談）。

PNG の環境政策は、法令等の整備は行われつつあるが、環境保全省自体の予算と人員が少なく、州段階では専門担当部局の未設置のものが多く（西ニューブリテン州は未設置）。そのため環境政策の実施は未だその緒についたばかりの状態と言えよう。

SBLCの環境対策は、PNG では先駆的事例として政府関係機関から高く評価されていること、今回の従業員、周辺住民の調査結果からも、特に厳しい環境問題は提起されておらず、環境政策の観点からは現在までのところ、優良事例として評価し得る。

現在熱帯林保全問題に関連して、一部に伐採事業を熱帯林破壊の有力な原因とする見解がある。SBLCの伐採事業は択伐形式をとっており、1ha当り50㎡程度の有用樹のみの伐採であり、その集材過程において機械を使用するため、若干残存木への損傷及び土壌の固化等がみられるが、UNITECH のサンプル調査によれば、著しい樹種構成の変化は認められていない。前述の通り同社では、伐採跡地にモニタリングの地域を設置し、本年度から林相の回復状況を計測する業務を開始している。この調査結果が判明するのは今後数年は要するとしても、今回のSBLC従業員に対する面接調査では、伐採事業による環境影響については、伐採地における動・植物、水量、水質が大幅に変化したと回答したものは無く、若干変化したとしてい

るものがほとんどであり、また住民調査においても伐採事業について環境的配慮を強化して欲しいと要望したものは3名に過ぎないことから、現在の伐採方法でもそれほどの環境破壊にはならないものと考えられる。一方、造林事業は一時的に皆伐を行い、一斉林を造成するため造林地については環境変化が起こることになるが、その動植物・水環境に対する影響は時間と共に漸次解消されると認識している住民が多い。人工造林地は天然林に比較して木材の生産性ははるかに高く、これによって天然林に対する圧力が軽減され、熱帯林の保全にも役立つというのが世界的な認識である。このメリットは環境に対するマイナスの影響をはるかに越える。造林事業の実施に際し、周辺に天然林を残置すること等により環境影響を極力緩和することは必要である。

したがって、森林開発事業のなかで将来の事業の基礎となる造林事業が並行的に実施されることは適切であり、伐採跡地の林相回復状況の調査結果が回復を保障すれば、天然林を更に賢明に利用することで、木材生産の増大が期待できよう。

8-3 JICA開発協力事業の観点からの評価

8-3-1 試験事業としての評価

JICAの開発投融資事業の試験的事業は、開発事業のうちで試験的に行われるもので、技術の改良または開発と一体として行われなければ、その達成が困難である事業を対象としている。

SBLCの試験造林事業は、本体事業である天然林の伐採、丸太輸出、製材の各事業を実施するため、PNG 政府より木材資源の減少を防止し、将来木材生産力の低い天然林に代替して生産力の高い人工林の造成を本体事業実施の条件として要請された事業である。

PNG 国においては、SBLCの企図する広葉樹の用材を目的とした人工林造林の事例は非常に少ない。そのため造林技術はもちろん、用材を目的とした人工造林の経営技術もほとんど確立されていない。

SBLCは1970年当地に進出し、1976年から1978年にかけて(株)南方造林協会の委託を受け 255 haにカメレレ、ルシーナの造林を実施した経験をもとに、1982年からJICAの融資により今回調査対象のカメレレ、エリマ、ターミナリヤ、チーク4樹種の試験造林を実施したものである。

本調査対象の試験造林事業は前章記述の通り各試験項目共に一応の成果をあげ、これに続く造林事業へ活用されていることは投融資事業としては優良事例として評価し得る。

8-3-2 評価上の改善点

今回の調査団の目的は地域開発効果等の評価であり、これは試験的事業等の完了後一定期間を経過した時点で、「開発協力事業が当該地域の開発・発展にどれだけ寄与したか」あるいは「当該国家の開発・発展にどのように活用されているか」を測定し評価するものである。

既に述べて来たように、これらの目的を達成するため 100人を超える住民に対する聞き取り調査の他、政府、州、各企業からのヒアリング、現地踏査等を実施し、一定の成果をあげたところであるが、試験的造林事業についてのこの種の評価調査は過去に事例がなく、調査手法についてはより多くの調査事例を積み重ねて改善していく必要がある。

具体的には、今回地域社会・経済に対する寄与の効果を測定するため、試験的造林事業により地元資材調達、地元雇用について推計したが、事業実施後長期間経過したあとで事業量、事業費を推計することは多大の労力と時間を要することから、これら基礎的データについては、事業実施中又は直後に測定されておくことが望ましい。

一方、林業の特殊性から苗木の生産～収穫（伐採）まで数十年と長期間かかることから、相手国政府、地域住民に技術開発効果が移転・定着していくには相当期間を要することが考えられ、今回だけの測定・評価のみならず、例えば、伐採期が到来して成果がより明確になった時点での測定・評価も必要と考えられる。

8-3-3 開発投融資事業と開発協力調査等との連携について

SBLCの開発事業については、JICAにより1979年にホスキンス森林造成開発協力基礎二次調査、1980年アニア・カピウラ林業開発協力基礎二次調査及びホスキンス森林造成開発計画調査が実施されている。その他毎年SBLCの職員研修の受入れがある。

JICA開発投融資事業の最も特徴的なものとして、上記の技術指導との連携が図られていることがあげられる。

今回の調査では、SBLCの事業展開についてSBLCの現地日本人職員は、これら開発協力調査が事業計画策定上大きな役割を果たしたとの謝意表明があった。また、従業員面接調査において、JICA研修を受けたことのある従業員は、研修効果を高く評価していた。一方、「7-2 試験事業の成果と現状」で述べた様に、今後造林技術上の検討事項につき、専門家派遣等によるSBLCに対する技術的支援が希望されるなど、技術面の一層のバックアップが必要とされている状況である。

今回の評価調査によって、SBLCの企業活動は環境問題にも十分配慮し、現地の社会・経済開発に大きく貢献しており、ODA 対象事業としての効果を発揮していると認められるので、今後もさらに支援を強化して行くべきであろう。

9 . 提 言

9-1 開発協力事業

調査結果で明らかなように、本件試験事業及び関連施設整備事業の双方ともが多大の地域開発効果を上げ、受入れ国政府から住民に至るまでの高い評価を得ていて、事業完了後10年近く経過した今も本事業の地元社会経済に与えているインパクトは多大である。このように、事業が受入れ国の政策に沿い、地元の社会経済にも適切な貢献を為しうるように指導・援助する開発協力事業の役割は重要であり、本件の場合それが十分に機能しているといつてよい。近年、熱帯林保全に対する世界的な関心の高まりに応じて、さらに注意深い森林の取扱いや地元社会に対する配慮が求められていて、「環境影響調査」や「社会経済ベースライン調査」が重要となつてきている。従来の技術的支援に加え、これらの調査の計画と実施についてもなお一層指導・援助を積極的に行つていくべきである。この場合、当該国に存在する能力の活用にも配慮することが望ましい。

9-2 評価調査

本件のような地域開発効果の測定評価では、本来「社会経済ベースライン調査」や「環境影響調査」等が先行しなければならない。出発点の情報が明らかになつていなければ後日の効果測定評価は間接的な方法に頼らざるを得ず、評価の信頼性を高めるためには多大の労力を要する。従つて、融資決定と同時にこれらの調査を実施する必要がある、その後5年毎にモニタリングを行うなどすれば、開発効果の測定評価は極めて容易になるであろう。これら諸調査の要目を含む評価のガイドラインを作成し実施に移す必要があると考えられる。実施に当つては9-1で述べたように、できるだけ現地能力の活用を図るべきであろう。

9-3 熱帯地域における造林の推進

世界的にも熱帯地域における造林の推進が緊急・優先課題となつている。1985年以來「熱帯林業行動計画」が世界的合意となり、これに基づく国別の行動を起こすことが急がれているが、必ずしも期待どおりの進捗がみられていない。造林について見れば、急速な拡大が望まれているにも拘わらず、現在の熱帯林の総減少面積1,700万ha/年の10%未満しか実行されていないことが憂慮されている。

わが国でも林野庁の熱帯林問題懇談会(大来佐武郎座長)が1990年5月の中間答申のなかで熱帯における造林の推進を優先施策の一つに掲げている。しかし、ここで注意を要するのは、今まで熱帯地域における造林が期待どおり進まなかつたのは何故かという問題分析である。土地利用区分及び所有・利用の権利関係が不明確なこと、また造林主体や受益者

は誰なのか、それらの関係が明瞭でないこと等が造林の開始を妨げる主な問題になっている。故に、これらの問題について検討することが強く望まれる。これらが解決すれば、わが国民間企業による熱帯造林は増加する可能性があり、特に本件の場合においては、的確な造林主体(SBLC)が存在し、受入れ国(PNG)の政策とも合致し、地元住民にも歓迎されていて、造林拡大のための条件は整っていることから好条件に恵まれているといえる。

関係省庁、JICA等は、熱帯林保全戦略の一環としてわが国民間企業等の資金と政府資金との有機的連携のもとに、熱帯造林の推進に向けて積極的に対処すべきであり、制度や手続きを合わせた造林関係融資の改善等も今後の検討課題である。

別添資料

1. SBLC職員、地域住民面接調査表
2. PNG 環境計画のガイドライン案（林業部門）
3. Manual on Environment Protection Measures (SBLC)

収集資料一覧表

12. What was your main source of income before you got a job with SBLC?.

- a. Farming
- b. Employee of an enterprise
- c. Your own business
- d. Others(What is that?)

13. What was the reason when you applied for a job with SBLC?

- a. Attractive wage
- b. Development of professional career
- c. Good working conditions
- d. Recommendation of friends or relatives who were working at SBLC.
- e. Unemployed. No other alternatives but SBLC.
- f. Others (What is that?)

14. How do you commute to SBLC?

- a. Distance from residence to SBLC Km
- b. Time required for one way hr. mnt(s)
- c. Means of commutation
 - a) On foot
 - b) PMV
 - c) Bus
 - d) SBLC's bus
 - e) Others (What is that?)

15. How long have you been staying at the present address (town or village) ?

- a. Since you got a job with SBLC
- b. Since 19 after you got a job with SBLC
- c. Since 19 before you got a job with SBLC

16. What is your residence at present?.

- a. Your own house
- b. Rented room, house
- c. A house provided by SBLC
- d. Dormitory of SBLC

17. How is your evryday life since you got a job with SBLC?.

a. Life has become better.

b. Life is getting worse.

c. No change

(What are the reasons for above "b"?

)

18. Are you happy to work with SBLC?

Yes

No

(If "No", what are the reasons for that?

)

19. Are there any inconveniences working at SBLC.

Yes

No

(If "Yes", what are they?

)

(Question 20 to those who have experience in reforestation)

20. Have there been any changes of the environment in and around the reforestation project site?

i. Natural environment

a. How are the plants and animals?

a) Decreased very much

b) Slightly decreased

c) Same as before

b. How are the quantity and quality of water in the stream?

a) Changed very much (quantity, quality or both)

b) Changed slightly (quantity, quality or both)

c) Same as before

c. Do you see more eroded lands than before?

Yes

No

ii. Social environment

Do you think it is harder now to do farming, grazing and hunting in the forest than before?.

Yes

No

(If "Yes", what are the reasons for ?

)

(Question 21 to those who have experience in logging)

21. Have there been any change of the environment in and around the logging project site of SBLC?

i. Natural environment

a. How are the plants and animals in the forest?

- a) Decreased very much
- b) Slightly decreased
- c) Same as before

b. How are the quantity and quality of water in the stream?

- a) Changed very much (quantity, quality or both)
- b) Changed slightly (quantity, quality or both)
- c) Same as before

c. Do you see more eroded lands than before?

Yes

No

ii. Social environment

Do you think it is harder now to do farming, grazing and hunting in the forest than before.

Yes

No

(If "Yes", what are the reasons for ?)

(Question 22. to those who have experience in road construction)

22. Have there been any changes of the environment in and around the road construction project site?

i. Natural environment

a. How are the plants and animals?

- a) Decreased very much
- b) Slightly decreased
- c) Same as before

- b. How are the quantity and quality of water in the stream?
 - a) Changed very much (quantity, quality or both.)
 - b) Changed slightly (quantity, quality or both)
 - c) Same as before

ii. Social environment

Do you think it is harder now to do farming, grazing and hunting in he forest than before.

Yes No

(If "Yes", what are the reasons for?

)

23. Do you think the life of the people living in and around the SBLC project site has changed?

Yes No

a. If "Yes", is it better or worse than before?

Better Worse

(Reasons why:

)

b. If you think people's traditional life has been changing, what do you feel?

- a) It is a great pity.
- b) It is a reasonable cost for development.
- c) It is positively good.

Thank you !

10. Have you ever worked for reforestation project of SBLC?.

i. Yes No

ii. If "yes", please answer the following questions a, b, c and d;

a. What type of work was it?

a) Manager

b) Machine operator

c) Worker

d) Others(What is that?)

b. How long did you work?

_____ Year(s) _____ Month(s) _____ Week(s)

c. What were the changes, if any, to your everyday life brought about through that work?

a) Life was better.

b) Life was worse.

c) No change

(What were the reasons for the change?)

11. Are you using the forest in the adjacent area of the reforestation project site?

i. Yes No

(If "Yes", please answer the following question

ii. and iii)

ii. The use of forest is for:

a) Firewood collection

b) Hunting

c) Shifting cultivation

d) Food collection

e) Timber(for housing and/or sale)

f) Others(What is that?)

iii. Have there been changes, if any, about your use of the forest?

a) Changed, and it is easier than before.

b) Changed, and it is harder than before.

c) No change

(What are the reasons for change to answers

"a" and "b"?)

- iii. With the construction of roads, what changes have occurred to your everyday life?
- a) Life has become better.
 - b) Life has become worse.
 - c) No change.
- (What reasons are there for the change to "a" and "b"?

15. Do you and your family members use the bridges constructed by SBLC?

Yes

No

(If "Yes", please answer the following questions i, ii and iii)

i. How often do you use the bridges?

- a) Everyday
- b) A few times a week

ii. For what purpose do you and your family members use the bridges?

- a) Going to work
- b) Going to school
- c) Going shopping
- d) Farming
- e) Your own business

f) Others (What is that?)

With the construction of the bridges, what changes have occurred to your everyday life?

- a) Life has become better.
- b) Life has become worse.
- c) No change.

(What reasons are there for change to "a" and "b"?

16. Do you and your family members use the feeder roads constructed by SBLC?

Yes

No

(If "Yes", please answer the following questions i, ii and iii)

i. How often do you use the roads.

- a) Everyday
- b) A few times a week

ii. For what purpose do you and your family members use the roads?

- a) Going to work
- b) Going to school
- c) Going shopping
- d) Farming
- e) Your own business
- f) Others (What is that?)

17. SBLC has moved in here and is operating logging, reforestation, sawmilling and road construction projects.

i. What changes have occurred to your everyday life?

- a) Life has become better.
- b) Life has become worse.
- c) No changes
- (What reasons are there for the change to "a" an "b"?)

ii. What do you expect from SBLC?

- a) SBLC expands its operation.
- b) SBLC continues its operation as it is doing now.
- c) SBLC continues its operation but with some changes. (What changes in which of logging, reforestation, sawmilling and others are they?)
- d) SBLC stops part of its operation.
(Which part of its operation should be stopped?)
- e) SBLC stops its operation altogether.
- f) Others (What is that?)

Thank you !

環境計画のガイドライン案 (林業部門)

PROPOSED ENVIRONMENTAL PLAN GUIDELINES

(FORESTRY)

VOLUME A.

An Executive Summary.

This shall, concisely, describe the proposed development, its anticipated biophysical and social impacts, remedial actions proposed and the benefits to be derived from the development (including a statement on the consequences of no development) and the end use plan for the development in relation to the needs of the community.

A statement of mitigatory measures and compensatory proposals will be provided.

The proponent must also make clear at this stage how they will achieve the principle of sustained yield forest management practice as required by the National Government. It is expected that the proponents will be required to comply with the provisions as stipulated in the Timber Permit or Licence.

The proponent must also clearly indicate how they will achieve the principle of natural resource conservation as identified in the Fourth Goal of the National Constitution.

The Executive Summary shall be submitted in English and Pidgin (Tok Pisin) or English and Motu, as appropriate. Where possible this Executive Summary will also contain a version in the local language.

VOLUME B.

Detailed Environmental Plan.

This shall consist of the following parts:

Introduction.

A concise description of the project, with details of its objectives.

1. PURPOSE OF THE DEVELOPMENT.

(a) The development shall be undertaken in compliance with:-

- (i) the Fourth National Goal and Directive Principle of the Constitution of Papua New Guinea which states;

"We declare our fourth goal to be for Papua New Guinea natural resources and environment to be conserved and used for the collective benefit of us all, and be replenished for the benefit of future generations".

- (ii) Environment & Conservation Policy (A Statement of Principles); and
- (iii) the National Forest Policy.

The Environmental Plan proposal must demonstrate compliance to the above three instruments.

- (b) A presentation shall be made by the proponents to demonstrate commitment to the principle of sustained yield harvesting and conservation as prescribed in National Forest Policy and Environment & Conservation Policy.

The proponent shall demonstrate commitment to the conservation of natural resources and multipurpose values of the proposed development areas including the outstanding physical features, the diversity and abundance of the biological communities and the historical and cultural values and uses of the area.

- (c) Any activities of the proponents that cause long-term or irreversible and irretrievable changes to the integrity of the forest ecosystem and resources must be detailed.
- (d) A statement, or discussion, shall be made on the compatibility of the proposed development with national and provincial plans, goals and planning guidelines where they apply.
- (e) The total capital cost of the development, the economic and the social benefits accruing nationally, provincially, and to the immediate community will be stated. These must be clearly defined and substantiated by a clear statement of fund commitment to specific project benefits.

2. VIABILITY OF THE PROJECT.

- (a) Technological expertise and resources of the proponent (s).
- (b) Technological requirements (tractors, jinkers, sawmills, etc...).

(c) Feasibility investigations. These should include:-

- * technical feasibility of the proposed sustained timber yield harvesting programme. (This must include a detailed annual sustainable cut calculation extrapolated over the project lifetime, full identification of data sources used to prepare this model).
- * economic feasibility of the project including identification of potential markets for value-added products and projected ratios of log to value-added product.
- * economic feasibility must be balanced by technical feasibility. This information will provide a basis for evaluating the viability of the proposed environmental, financial and social benefits.

(d) The method of site selection, including alternatives investigated and the rationale and reasons for the final selection.

(e) Forest Resource Management.

(i) Sustainable Timber Harvest.

The proponent shall demonstrate compliance to the Sustained Yield Management of the forest resource in accordance with National Forest Policy including:-

- * sustained timber yield methodology;
 - calculation of annual growth increment (cubic metre/hectare) and derivation of source data.
 - calculation of annual allowable cut and identification of all assumptions made.
 - harvest rotation plans, minimum (dbh) specifications and individual species management strategies.
 - enrichment planting.
 - development of plantations.
 - nursery plan.
 - reforestation programme.

- * techniques to be employed;
 - full detailed description of selective logging techniques from tree identification to offsite loadout.
 - ongoing check and monitoring procedures to substantiate the predictions derived from the methodology.
 - design and implementation of ongoing adjustments and controls to ensure sustainability is maintained.
- * allocation of land for reserves, conservation areas, buffer zones, clear fell logging operation or agricultural and agro-forestry redevelopment. These will provide the basis for the final land use allocation as portrayed in the Final Land Use Plan.

- (f) Proposed future developments (project phasing) including feasibility studies that will be required to implement these.
- (g) Detail the consultation process with local communities in preparation of the Environmental Plan and the establishment of a subsequent community based consultation mechanism throughout project term.

3. PHYSICAL DESCRIPTION OF THE PROPOSED/DEVELOPMENT.

This shall include:

- (a) Geographical location.
- (b) The proponent shall provide the detailed Forest Working Plan including detailed maps showing:-
 - * timber area;
 - * logging coupes;
 - * different vegetation classifications/zones;
 - * special management and conservation zones;
 - fauna and flora conservation/protection areas
 - water course buffer zones.
 - scientific study areas.
 - water supply catchment areas.
 - gene pool areas.
 - sensitive habitat areas.
 - * environmentally critical and fragile areas (e.g. fragile soils, steep slopes);
 - * haulage roads;
 - * major arterial snig tracks;
 - * ramp sizes and locations;
 - * drainage systems;
 - * defined water courses and their crossing locations and the design of these crossings;

- * reserves including hunting and gathering, gardening, residential, cultural and sacred sites;
- * existing settlement and infrastructure;
- * nursery areas;
- * plantation areas; and
- * sawmill site.

- (c) A detailed Final Land Use Plan showing the same area under the final end-use as proposed in Section 2(e).
- (d) Land availability, including hectarage and existing landuse patterns (traditional and commercial).
- (e) Labour requirements of project which are to be detailed (information here should include ratio of local labour, technical skills requirement and technical skills training for locals).
- (f) The development, site development shown on plans, together with the infrastructure required. The main infrastructure developments such as the base-camp, sawmill, worker's accommodations, office, workshops and stores, etc..should be described in detail including site plans with particular reference to the identification of all potential impacts and the proposed impact mitigation methods to be followed. Where other, particularly beneficial developments are proposed, these should also be described in similar detail.
- (g) Details of land and water conservation measures to be applied including waste management plans and mitigation of potential impacts from water and solid waste disposal.
- (h) Rehabilitation programme during and at the end of project life.. This must be related to the Final Land Use allocations and the Final Land Use Plans. A long term management programme to achieve the Final Land Use must be submitted giving details of specific rehabilitation techniques and strategies.

4. DEVELOPMENT TIMETABLE.

- (a) Life of development including phased development.
- (b) Description of the sequence of development. This includes a graphical (or diagrammatic) schedule for clearing, infrastructural construction or installation and production.

5. THE EXISTING SOCIAL AND ECONOMIC ENVIRONMENT.

- (a) The socio-economic component consists of all social and cultural features relating to human settlement both existing and past:-
- * Clan and tribal history.
 - * Settlement pattern and history.
 - * Land tenure (with maps and clan land boundaries)
 - * Landuse pattern in existence.
- (b) The social demographic component of the community should be detailed:-
- * Population by village (including density).
 - * Age-sex distribution by village.
 - * Employable labour in each of the villages surveyed.
 - * An assessment of the health status of the project area.
- (c) The social and economic infrastructural component will detail:-
- * Existing social and economic infrastructure (aid posts, schools, trade stores, roads and bridges, airstrips, wharfs, communication installations, water supply, energy supply and demand on the community).
 - * Economic and business activities (including ownership and an assessment of their present operational conditions (profitability etc...)).
 - * Social and administrative services.
 - * Available labour skills.
- (d) Cultural Sites and Material Culture Conservation.
- * Identify and protect all historical, archaeological and ethnographic sites and sites of contemporary significance.
Maps should be provided in the Environmental Plan.

6. SOCIAL AND ECONOMIC IMPACTS AND MITIGATORY MEASURES.

- (a) To identify the possible social and economic impacts of the proposal on the social environment (including direct possible impacts on human health and welfare).
- (b) To forecast, if possible, the possible reactions of the local population to the effects of the proposal on their social and physical environment.
- (c) To inform potentially affected people of the proposal and of its potential environmental and social ramifications.

- (d) To understand the values and concerns held by individuals and groups about the quality of environment that might be affected by the proposal. (These views and concerns should be evaluated for the purpose of determining whether to pursue them any further and if so, ... How?).
- (e) An assessment of activities (forestry related or others) in the same area that could lead to cumulative social effects or interaction of such effects.
- (f) Reasonable foreseeable indirect impacts or secondary effects due to socio-economic changes resulting from impacts on forest and environment including linkages and multiplier effects.
- (g) Possible compensatory actions to overcome damages to the natural systems, the people and their social environment.
- (h) Are there any specific risks groups within the impact area, who are they and what risks are involved?.
- (i) Monitor to minimize or remedy possible adverse social impacts including impact assessment and regulation.

7. THE EXISTING BIOPHYSICAL ENVIRONMENT.

- (a) This section requires a detailed biophysical environmental investigation which will include:-
 - * A descriptive physical component of the environment.
 - this should be composed of geography/topography, geology and geomorphology, soils, hydrology, water quality, oceanography (including wharfage and moorings) and climatology.
 - * A descriptive landuse component giving details of existing virgin forest stands and corridors, logged-over areas, plantations, villages and associated garden areas and other categories as may be required (e.g. lakes, grasslands).
 - * A descriptive biological component giving detailed information on the flora and fauna; information on methods of data collection should be included as well as results of predictive techniques and data collection.
 - this should include vegetation, terrestrial fauna (mammals, other vertebrates, avifauna), aquatic habitats and fauna.
 All rare/endangered and protected species to be identified and their habitats defined within the project area.

8. BIOPHYSICAL ENVIRONMENTAL IMPACTS AND SAFEGUARDS.

- (a) A description of the potentially affected environment, including specific information necessary for identifying and assessing the environmental effects of the proposed activity.
- (b) An assessment of the likely or potential environmental impacts of the proposed activity and alternatives, including the direct and indirect short-term and long-term cumulative effects.
- (c) A description of practical sustained forest resource harvesting alternatives as appropriate.
- (d) An identification and description of measures available to mitigate adverse environmental impacts of the proposed activity and alternatives, and a feasibility assessment of those measures.
- (e) An indication of whether the environment of any other area beyond the immediate jurisdiction and operational area of the project is likely to be affected by the proposed activity or alternatives (externalities or trans-boundary effects).
- (f) An assessment of activities (forestry related or others) in the same area that could lead to cumulative effects or interaction of effects.
- (g) An assessment of possible compensatory actions to overcome damages to the natural environment, be made.
- (h) Impacts on key wildlife species and efforts to safeguard their populations to be stated.
- (i) An assessment of fauna and flora conservation measures appropriate to meet local, provincial and national conservation objectives.

9. FURTHER AND FUTURE FINDINGS.

- * What is not yet known and why?
- * What could be known with more time and money?

10. ENVIRONMENTAL MONITORING AND MANAGEMENT.

- * Details of the Environmental Management and Monitoring Programme (EMMP) as required during the course of the development are to be provided. In the Plan a timetable for regular environmental impact monitoring and reporting should be required.

The EMMP will include a baseline study (pre development) and operational monitoring. The operational monitoring programme may include the biological, physical, chemical and social environment affected by the project.

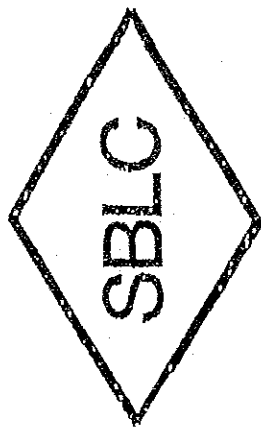
The EMMP will be submitted to Department of Environment & Conservation for technical assessment and approval prior to commencement of timber harvest operations.

NOTES:

23/10/90.

資料：環境保全省

STETTIN BAY LUMBER COMPANY Pty Ltd



EVERY WORKER IN THE FIELD SHOULD
FOLLOW THE RULES SET OUT IN THIS
BOOK!

MANUAL ON ENVIRONMENT
PROTECTION MEASURES

for Talasea, Hoskins, Kapiura and
Ania-Fulleborn Timber Areas

RESPECT AND PRESERVE THE
CULTURAL AND TRADITIONAL SITES!

MINIMISE THE DAMAGE CAUSED BY
LOGGING AND ROADING!

Prepared for Stettin Bay Lumber Company
by G.S. Vatasan, R.N. Vatasan and D.Kari
March 1990

別添 3

INTRODUCTION

The Environmental Plan submitted by Stettin Bay Lumbar Company Pty Ltd was approved and commended by the Minister for Environment and Conservation. In the Minister's letter of 4 October 1989, it is requested that a manual containing measures for the protection of the environment be issued for the instruction of employees of the company.

This manual has been prepared in response to the Minister's letter and after its approval will be used to instruct all employees involved in logging, roading, skidding, reforestation, sawmilling and timber preservation as well as by the supervisory and managerial staff.

It is hoped that it will help to instill each employee with the need to protect the environment.

Logging natural forest in PNG produces timber and creates jobs for the people in the area. It also brings roads, schools, aid posts and offers the possibility for local people to get into business activities.

Logging also allows, if properly done, the forest to regrow and produce more timber in the future. On the other hand, some areas are cleared after logging. This is done to allow the land to be used for agricultural development or for forest plantations.

Logging and the construction of roads can be very damaging to

Page 1

TABLE OF CONTENTS

Content	Page
Introduction	1
Objectives	4
Surveying and Marking	5
Road Construction	11
Logging	16
Skidding (snigging)	20
Loading and haulage	24
Clear Felling and Reforestation	27
Fire Control	29
Sawmilling	31
Social Impacts and Safeguards	33
Acknowledgements	39

the environment because:

Trees are chopped down.

Soil and plants are disturbed by machines.

Roads and tracks collect water and cause scouring.

Provide easy access to cut and burn gardens in the forest.

Many young trees are damaged by logging and will die.

It is very important to do all the logging jobs properly. Only by taking care at each step in logging, will the soil and the forest be protected. Only if the environment is protected during logging will the forest regrow and the wild animals and birds survive.

This manual sets out the correct way to build roads and log the forest. It tells what to do and what not to do to protect the environment. It tells how to survey the work and to mark the road lines. It shows what trees to fell and what to protect. It also shows how to use the machines to prevent erosion and soil compaction. If you follow what is in this booklet you will help protect the environment. You will also find that your work is getting better. You will produce more timber and will reduce damage to the machines. What is very important is that you will minimise any adverse effect on the environment.

All employees and contractors of the company are guests on the land. Only the trees to be cut have been purchased. The land, the food trees, the left over trees, all belong to the landowners. The birds, the animals, the fish in the streams and the sea also belong to the village people. They will also belong, if protected, to the villagers' children and childrens' children.

Because the village people consider that everything in the air, on the ground or in the water belongs to them, no hunting, fishing, fruit picking or material gathering by outsiders is tolerated. This is true even on land or shores occupied by the company. Only within the limits of the living compounds can the employees dig gardens and grow produce for themselves.

The villages, the gardens, the cemeteries and other sacred places are tambu to outsiders. Company people should visit these places only when invited by the villagers themselves. At all times the employees and the contractors should remember that they are guests on the land, not owners.

OBJECTIVES

The purposes of this manual are as follows:

- a. To provide an awareness in every employee of the need for the protection of the Environment within the Timber Area.
- b. To spell out the control and protective measures to be adopted by SBLC while harvesting the Timber Area.
- c.- To prepare every employee for proper management of the physical environment.
- d.- To translate the Environmental Plan of the Company into simple and specific instructions for the employees to implement.

SURVEYING AND MARKING

There will be two types of surveys: for roading and for forest resource assessment.

All work done in the forest or on sites should be properly surveyed and marked before starting. By marking the work in the field, fewer mistakes will be made. Common mistakes during logging are:

Wrong location of roads and tracks .

Cutting trees across streams.

Snigging through streams.

Cutting the wrong trees .

Cutting trees too close to villages.

Cutting trees too close to gardens.

Upsetting burial grounds.

Cutting trees used for fruit or material by villagers .

Causing scouring and silting

The following points have to be observed with regard to road surveys:

- a.- All logging and main roads must be surveyed on alignments established along appropriate locations.
- b.- Road alignments must not go through reserves, cemeteries and traditionally important sites. These have to be identified along the alignment and special signs should be set up to warn the construction teams and bulldozer operators to keep out.
- c.- Road alignments must consider economics of skidding and haulage, as well as volumes of timber available in the coupes.

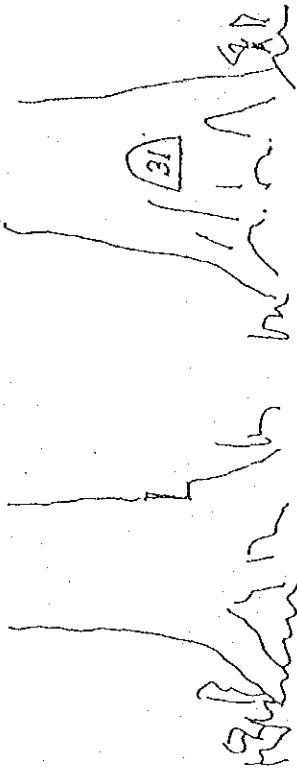
The following points will have to be observed with regard to forest resource assessments.

- a.- All coupes must be surveyed to determine the volumes and species to be extracted in each coupe. 20% sampling intensity is acceptable.
- b.- Before logging, "setups" of 100ha will be established and inventoried at 100% intensity. At the same time all the trees to be felled will be marked.
- c.- All merchantable trees over 50cm diameter will be marked and numbered on the stem at 1.3m above the ground.
- d.- During surveys, lines will be cleared around villages, gardens, reserves, streams and rivers at the required protection distance.
- e.- Mother or seed trees will be marked to be protected.
- f.- As indicated by villagers, fruit trees and trees for canoe construction will be marked to be protected.

DO KNOW THE MEANING OF MARKINGS:

BLAZE AND NUMBER ON THE TREE STEM

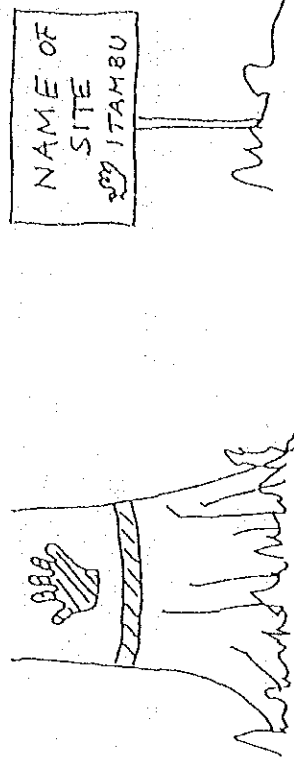
This tree is to be felled. It has been surveyed and measured.



Tree marked and numbered for felling.

RED RING AROUND THE STEM AND TAMBU SIGN

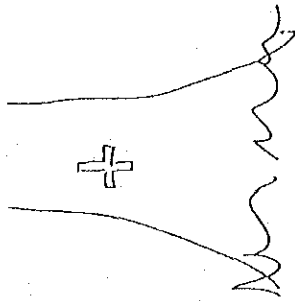
These trees mark the boundary of village, gardens, stream



reserve, burial ground. The TAMBU sign faces the outside of the

prohibited area. DO NOT GO OR DRIVE MACHINES PAST THESE TREES!

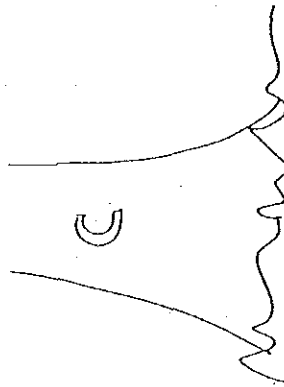
CROSS ON THE TREE STEM



Seed tree

The trees marked with a cross are seed (mother) and reserve trees. DO NOT FELL OR DAMAGE THEM!

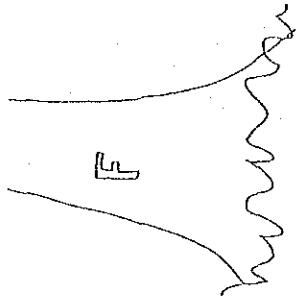
C MARK ON THE TREE: TREE RESERVED FOR CANOE BUILDING



canoe tree

Do not fell or damage trees marked with a C. These trees have been reserved by the village people for canoe building.

F MARK ON THE TREE: FOOD TREE OR RESERVED FOR OTHER USES



Food tree

Do not fell or damage trees marked with an F. These trees have been reserved by the village people as food trees or for materials or for ceremonial purposes.

PICKETS WITH RED TAPE: ROAD CENTRE LINE MARK

Clear a strip 30m wide along this marks for main roads. Clear a strip 20m wide for secondary roads.

PICKETS WITH BLUE TAPE: COUPE BOUNDARY MARK

Do not start work in a new coupe before it has been surveyed and marked.

DO FOLLOW THE MARKINGS

The markings have been put on the trees to be respected and followed. Following the markings will keep you and your matés out of trouble.

DO REPORT FADED OR DAMAGED MARKINGS

The next worker might miss a faded marking. Report it so that it will be redone.

DO NOT IGNORE MARKINGS IN THE FIELD

If you do not know the meaning of a marking, wait and ask the supervisor.

DO NOT DESTROY MARKINGS!

All markings have a meaning. If destroyed, the person coming after you will not know that meaning. Road centre line markings should be left till the road is actually constructed.

DO NOT GO OR DRIVE MACHINES PAST TAMBU MARKINGS!

Tambu markings mean **NO ENTRY** in an area. **THE TAMBUSIGN FACES THE OUTSIDE OF THE TAMBUS AREA.** If you go past them, you might destroy gardens, burial places, wild life reserves and also upset the people.

DO NOT DRIVE MACHINES ON UNMARKED LAND!

Most damage is done by bulldozers going all over the place, to find "good trees" or a better access. On unmarked land it is also possible to come on soft ground and bog down the machine. Wait for the supervisor to mark the area.

ROAD CONSTRUCTION

The operators of chainsaws, bulldozers, excavators and loaders should adhere to the following rules during road construction:

- a.- Follow the surveyed centre line markings for all roads, main and secondary.
- b.- Avoid damage to village, gardens, cemeteries and other sites. No roads should be built through these places.
- c.- No oil or fuel should be discharged where it could seep into the water system.
- d.- Permanent flowing creeks and waterways should not be blocked by soil and debris during road construction.

DO MARK THE CENTRE LINE ON ALL ROADS BEFORE CONSTRUCTION

The centre line gives the best "picture" of the road in the field. It allows the correct location of the cleared strip for the road. It makes the work of machines easier.

DO REPOSITION THE CENTRE LINE MARKINGS AFTER CLEARING

Most of the markings are lost during clearing of the road line. They must be repositioned for the earth works. This is the time to correct the road line, as it is now better visible than under the forest cover.

DO MARK THE CUT AND FILL LEVELS BEFORE STARTING WORK

On the main roads it is important to mark the cut or fill levels at each picket. Because these roads are much wider, mistakes in cut or fill levels can increase the earthworks substantially. This can also cause erosion and siltation.

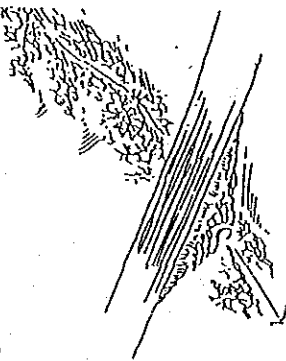
DO FOLLOW CAREFULLY THE MARKED CENTRE LINE OF THE ROAD

Any deviation from the surveyed centre line can cause extra work. At the same time, the road might become too steep or the corners too tight.

DO TAKE CARE OF WATER DRAINAGE ALL THE TIME

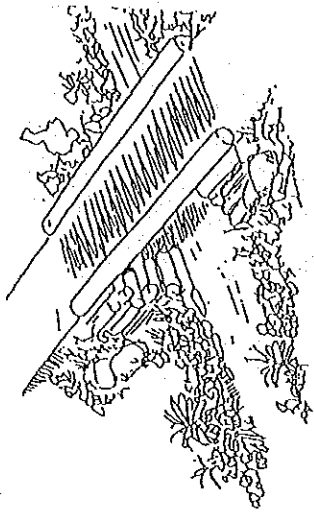
As you go ahead with constructing the road, water should not be allowed to puddle at any place. Make sure the water can go off the road platform as quickly as possible. This will avoid a lot of trouble later.

DO TAKE CARE OF STREAM CROSSING POINTS



Culvert

Culverts, bridges and fords should be prepared as soon as possible after access is opened to them. By quickly installing



Bridge

culverts and bridges, mud forming, erosion and siltation is avoided. It is also easier to form the road with the culverts and bridges in place.

DO FORM THE SIDE DRAINS ACCORDING TO THE PLAN

In soft soils like pummmice, side drains can erode very quickly. It is necessary in such situations to consolidate the drains against erosion.

DO INFORM THE SUPERVISOR OF ANY PROBLEM ENCOUNTERED

Do not try to solve alone problems with the machine such as: earth-slips, wet spots or springs. Ask the supervisor to decide what to do. If you try to "dig" around the problem with the bulldozer, more damage could be done.

erosion, even after the road is no longer used.

DO NOT DRIVE MACHINES INTO VILLAGES, GARDENS OR RESERVED PLACES

Heavy machines can do a lot of damage to the footpaths, fences, and other structures made of traditional materials. There is always the danger of accidents with young children or old people. Also, a heavy bulldozer can do a lot of damage to a traditional garden.

DO NOT DRIVE MACHINES UNNECESSARILY THROUGH STREAMS

Heavy machines pollute streams through stirring up silt. They can also pollute by leaking diesel or oil into the water.

DO NOT DO SURVEYS WITH THE BULLDOZER

Lots of damage to the soil and vegetation is caused by machines being driven all over the place to find "better routes" or "suitable trees". Routes should be identified and marked on foot, before machines are allowed in the area.

DO FINISH THE ROAD AS QUICKLY AS POSSIBLE

It is best to put the surfacing material on the road as soon as possible after being formed. This protects the road from water and from wear by vehicles trying to use it.

DO STOP WORK AND INFORM THE SUPERVISOR IF:

YOU COME ACROSS A BURIAL PLACE

YOU COME ACROSS WAR OR OTHER RELICS

YOU COME ACROSS AN OLD, ABANDONED VILLAGE

DO NOT DRIVE MACHINES ALL OVER THE PLACE DURING CONSTRUCTION

Heavy construction machines can damage the land near the road. This will result in erosion and siltation, as well as damage to the road later. It also causes unnecessary use of diesel and wear and tear of machines.

DO NOT PUSH DEBRIS INTO PERMANENT STREAMS

Debris such as trees, branches, stumps can block the streams creating ponds. These are dangerous in the case of floods. Debris, by rotting, pollutes the streams, killing fish. The water might also become undrinkable.

DO NOT BURY STUMPS OR BRANCHES INTO THE ROAD

Any such things will rot in time and the road will sink. This can start

LOGGING

The logging crews will work closely with the forest resource and road survey teams and will follow the Forest Working Plan. The following measures will be observed during logging:

- a.- Log only within the coupe(s) allocated by the supervisor.
- b.- Cut only the trees which have been marked and numbered by the survey team.
- c.- Minimise damage to seedlings, poles and residual trees.
- d.- Determine the direction of fall and cut escape routes before felling.
- e.- No trees should be cut within villages, gardens or other reserves.
- f.- Trees reserved by the landowners for cultural uses should not be felled.

DO FELL ONLY MARKED AND NUMBERED TREES

DO CUT ALL VINES ON MARKED TREES WELL BEFORE FELLING

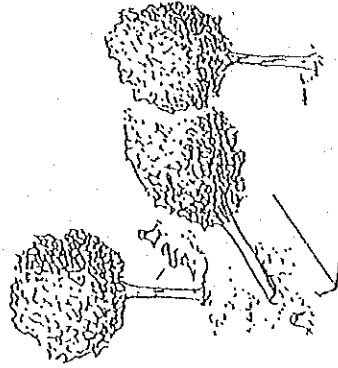
Vines tie-together many trees. This makes felling difficult because the trees hang on to each other. If the vines are cut earlier and left to die, the trees will fell easily to the ground. The felled tree will not drag with it other, younger trees. These trees will be left unharmed.

DO PREPARE THE SITE AROUND EACH TREE TO BE FELLED

By clearing the scrub, vines etc around the tree, the felling becomes safer. It also allows the choice of best felling direction. Do prepare escape routes before felling.

DO SELECT THE BEST DIRECTION OF FELLING

Lots of damage to the residual stand can be avoided by choosing the best direction of felling. This will also minimise the damage to the felled tree itself.



Extraction

DO NOT FELL UNMARKED TREES

These trees might be kept for their nuts or as nesting for birds. Or they might be needed for canoe building. It might also be that they are below the 50 cm limit of felling.

DO NOT FELL TREES ON SLOPES OVER 30 DEGREES

These are steep slopes on which the trees should not be felled.

The direction of felling cannot be controlled. Too much damage is done when the tree falls. If the tree is pulled out by skidder on such slopes, erosion might happen.

DO NOT FELL TREES CLOSER THAN 500m FROM VILLAGES

The trees around villages should be left as protection for the village. They also provide materials, fire wood and food to the village. It is also dangerous to fell trees too close to the village as small children might wander in the bush.

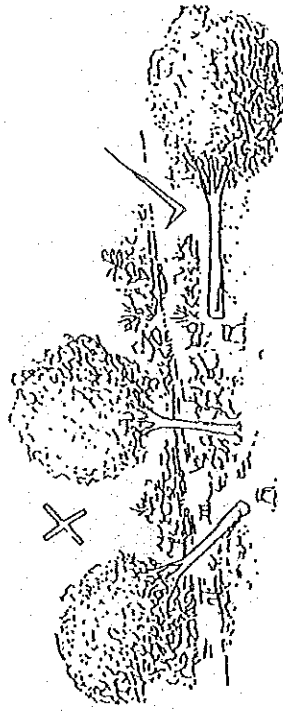
DO NOT FELL TREES CLOSER THAN 100m FROM GARDENS

The trees should be left to protect the gardens. It is also dangerous for the people working in the gardens to fell trees too close to them.

DO NOT FELL TREES CLOSER THAN 50m FROM STREAMS

Felling trees too close to streams can damage the banks. It can cause erosion and silting. Trees felled too close to the streams can block the stream or pollute it.

DO NOT FELL TREES ACROSS STREAMS



Trees felled across the streams can block the stream. This can cause pollution through leaves and twigs rotting in the water. It can also cause floods by damming the stream.

SKIDDING (SNIGGING)

Crawler tractors and tyred skidders will be used for moving logs from the stump to the dry docks (landings on the road side). The following measures will be observed during skidding operations:

- a.- The logging supervisors will establish and mark skidding tracks to minimise damage to regeneration, water ways, swamps and reserves.
- b.- There must be no skidding along creeks, streams and water courses.
- c.- There will be no skidding across reserves for gardens, burial places, villages, etc.
- d.- As far as practicable logs will be pulled by the butt end and partially lifted off the ground when skidding to minimise damage to the soil.

DO MARK ALL SKIDDING TRAILS

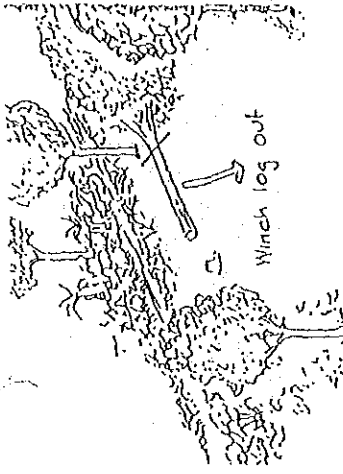
It is much easier to work if the skidding trails to most trees are marked. The skidder driver does not have to guess where he should go.

DO USE CRAWLER TRACTORS WHERE NECESSARY

On steep slopes and on wet or soft ground crawler tractors do less

damage and work better.

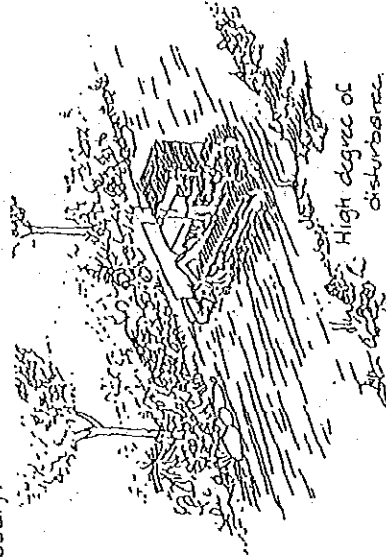
DO WINCH-IN THE LOGS WHERE NECESSARY



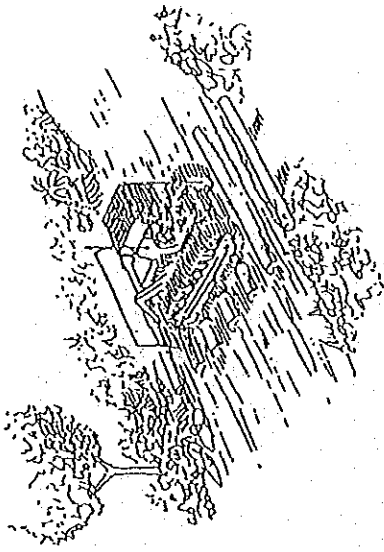
It is better to use the winch to pull the logs in difficult conditions, over short, steep "humps". The winch is also better for "breaking out" the logs from the felling place.

DO KEEP MACHINE ACTIVITY OUT OF STREAMS

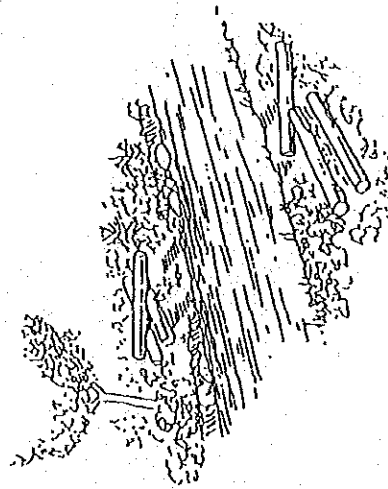
Crossing streams with machines does a lot of damage to the banks. Machines should not go into the streams unless absolutely necessary.



DO CORDUROY STREAM CROSSINGS WITH LOGS

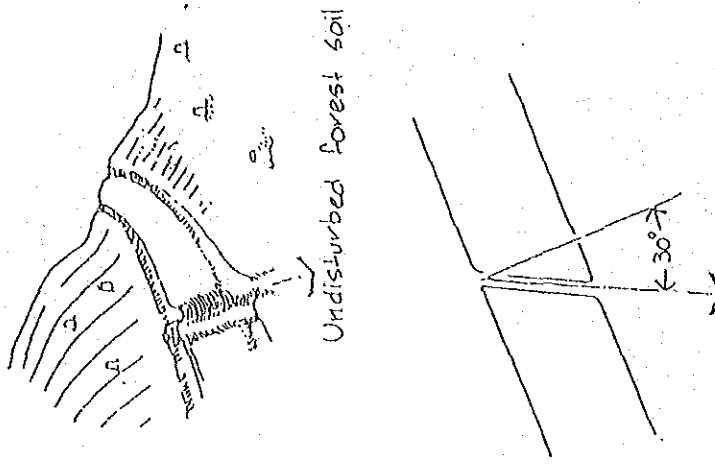


DO REMOVE THE LOGS FROM STREAMS AFTER LOGGING



DO DIVERT WATER FROM DISUSED SKIDDING TRACKS

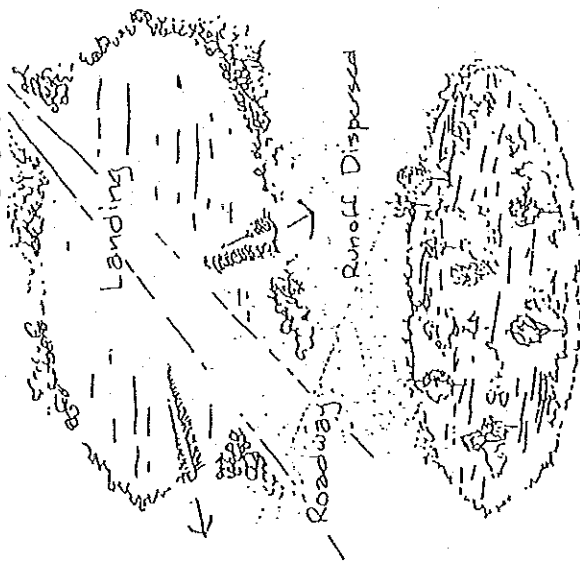
If water is allowed to run along skidding tracks for a long time it will cause erosion. By cutting drains across the tracks after the logging is finished, the water will be diverted into the undisturbed vegetation.



LOADING AND HAULAGE

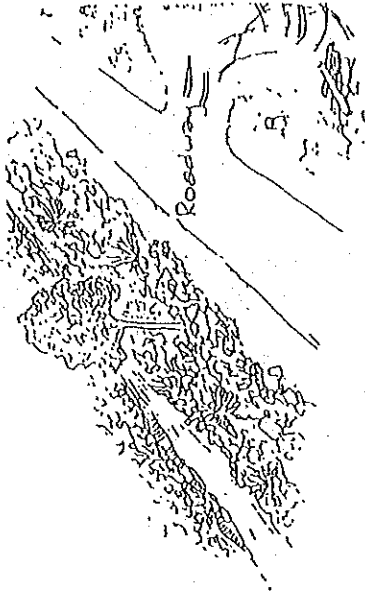
Loading of logs onto jinkers from the dry docks (log landings) will be done with front end loaders. The following measures will be observed for loading:

- a.- There will be a minimum of dry docks in each coupe.
- b.- As far as possible, the dry docks will be located on stable and level ground, to minimize soil erosion or silt discharge.
- c.- Wherever necessary dry docks will be ripped and revegetated after completion of logging operations.



Revegetated dry dock (landing)

- d.- Where the road is near a stream, the dry dock will be located on the side of the road away from the water:



DO LOCATE DRY DOCKS ON WELL DRAINED SITES



This is best achieved when the dry docks are located on a slight slope or ridge.

DO KEEP DRY DOCKS AWAY FROM STREAMS

Dry docks and fuel dumps should be located as far as practicable from streams and water ways. This will prevent the silting of streams and leaking of fuel into the water.



DO NOT PUSH DEBRIS INTO THE STREAMS

Debris accumulated onto dry docks should not be pushed into nearby streams. It is better to push it into the nearby forest or to spread it over a larger area.

DO NOT BURN DEBRIS IN THE FOREST

Dockings, bark and other debris accumulate on dry docks. If burned, the forest itself might catch fire. It is better to spread it into the forest. In time it will rot and act as fertiliser.

CLEAR FELLING AND REFORESTATION

Areas to be planted by SBLC or to be converted to agriculture will be clear felled. Clear felling will also be used to harvest the established forest plantations at maturity. During clear felling it is important to take all measures to prevent damage while the land is without much vegetation cover. The following steps will be taken to minimise the damage after clear felling:

- a.- Replanting will be done as soon as possible after clear felling.
- b.- Clear felling operations must be organised so as to allow movement of wildlife into areas not logged.
- c.- Special care will be accorded to reserves of natural vegetation along streams. Buffer strips should be left on both sides of permanent creeks and rivers to provide habitat for wildlife and to minimise pollution of the water system.
- d.- If burn-offs are necessary, they will be restricted to small areas, so as to allow wildlife to escape.
- e.- Steep slopes and swamps within the Timber Area will not be cleared. They will be left as reserves.

DO NOT INTERFERE WITH RESERVE ZONES

In clear felled and plantation areas the reserve zones are very important for the preservation of plants and animals. This is because the vegetation outside the reserve will be completely

changed.

DO NOT DISTURB THE SOIL UNNECESSARILY

The land will be without strong vegetation for a time. If the soil has been disturbed too much, erosion and silt transport might occur.

DO NOT DRIVE MACHINES ON STEEP SLOPES

Because the soil will be without protection for a time, any damage on steep slopes can cause erosion.

FIRE CONTROL

The Company has prepared a Forest Fire Control Plan. The main aspects of the plan are as follows:

- a.- There will be regular patrols of the plantations during the dry seasons.
- b.- Fire prevention notices will be put up in strategic locations within and outside the plantations.
- c.- Fire trucks/tankers will be on standby for emergency cases.
- d.- Fire control towers will be erected on suitable points and manned during dry periods to detect any occurrence of fires.
- e.- All employees will be instructed not to light any fires during dry periods.
- f. A continuous education campaign against lighting of fires in and around forest plantations will be conducted in collaboration with the village leaders.

DO TAKE CARE EVERY TIME YOU LIGHT A FIRE

All logging operations produce wood waste which dries and can easily burn. Make sure that fires are lit away from waste.

DO EXTINGUISH EVERY FIRE WHEN YOU LEAVE THE PLACE

Fires left unattended can easily spread to the nearby forest. Make sure there is no fire burning when you leave the place.

DO WATCH FOR FIRES DURING THE DRY SEASON

A small fire is easily extinguished. If you see any forest fire, try to extinguish it and report it immediately to your supervisor.

DO TELL PEOPLE TO PROTECT PLANTATIONS FROM FIRE

Many people light fires for fun or because they do not know the dangers to forest plantations. Try to prevent others from lighting fires near or within plantations.

DO NOT LIGHT FIRES WITHIN OR NEAR PLANTATIONS

Plantations burn much more easily than the natural forests. Even a short dry spell can make a plantation vulnerable.

SAWMILLING

The main dangers to the environment resulting from sawmilling operations consist of: pollution from rotting accumulated saw dust and waste, spillage of chemicals from timber treatment and leaks of fuel and lubricants from the power plant and workshops. The following are the measures taken to minimise pollution resulting from sawmilling operations:

- a.- Saw dust and waste from the mills will be continuously burned.
- b.- The timber treatment installations will be designed so as to prevent chemicals leaking into the water system.
- c.- Chemicals will be stored securely to prevent misuse or leakages.

DO TAKE CARE WHEN HANDLING CHEMICALS

Chemicals used for timber preservation are poisonous. If they reach a stream or creek, people using the water might be poisoned. It could also kill the fish.

DO WATCH FOR CHEMICAL LEAKS FROM THE TREATMENT PLANT

Careless storage or handling of chemicals at the treatment plant can cause leaks into the water system and poison people down stream.

DO PREVENT OIL AND FUEL LEAKS

Oil and fuel can pollute badly the streams and the sea near the sawmill and workshop. Make sure the used oil is collected and disposed of properly.

DO NOT DISPOSE OF WOOD OR OTHER WASTE IN THE CREEKS

All waste can pollute the water. Rotting sawdust is poisonous to fish. Workshop or household waste can also be poisonous. Dispose of it at the prepared dump.

SOCIAL IMPACTS AND SAFEGUARDS

There are two aspects of the social impact of logging and timber industry operations likely to affect the lives of the people in the Timber Area:

- a.- The use of the surrounding forest as the main source of food and materials for general purposes (house construction, tools, weapons, canoes, etc).
- b.- The disturbance or destruction of traditional, cultural or sacred sites.

The Company will rely on consultations with the villagers in the area, and with the Provincial Government to minimise any adverse effects of its operations. It will utilise its liaison officer and consultants to closely monitor the impact of logging on the people of the Timber Area. The measures taken to prevent disruptions of peoples' traditional and cultural life are as follows:

- a.- There will be no logging within 500m of any village.
- b.- There will be no logging within 100m of gardens in use.
- c.- SBLC employees who are not traditional landowners will not be allowed to make gardens, hunt or fish in the area.
- d.- The landowners will be given preference in employment and the opportunity to be trained for skilled jobs with the company.

e.- Landowners will not be restricted from entering the Timber Area for hunting, gardening and gathering firewood or building materials. However, access restrictions will apply for safety reasons where logging is in progress.

f.- Fruit and nut trees, construction or canoe trees, as identified by the people will be marked as such and will not be felled.

g.- A number of traditional and cultural sites has been identified within the Timber Area and will be protected as follows:

Around Amio (South Coast)

*- *Silepun*. The whole tip of Roebuck Point will be fenced off and is out of bounds for outsiders.

*- *Simepo/Simekiwi*. This area will be excluded from Amio Township development plan.

* *Puldung*. The South Coast road will bypass this point.

*- *Pasekiwi*. No trees and plants will be removed from this Tambu area.

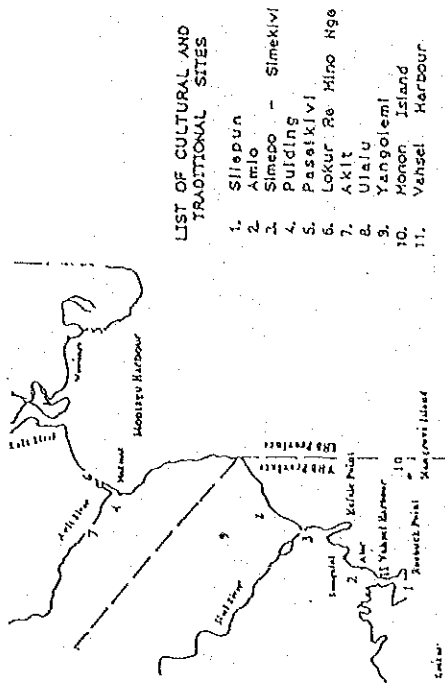
*- *Lokur Re Mino Nge*. This site will out of bounds to outsiders and will not be interfered with.

*- *Akit*. This area will not be logged.

*- *Ulaiu*. There will be no roading or logging in this place.

*- *Yangolemi*. There will be no disturbance to vegetation in the vicinity of this cave.

*- *Monon Island*. No outsiders will be allowed on this island.



Around Bereme (Central Part of Timber Area)

The following old village sites will not be interfered with and will be protected from disturbance during logging:

*- *Pumbumbo*.

*- *Verlingi*.

*- *Waterim*.

*- *Menwatha*.

*- *Nonu 1 and 2*.

h.- As it is likely that further such sites will be found during the roading and logging operations, the following measures will be taken to protect them:

1.- Work will be stopped and the supervisor be informed if machines come across:

Burial places

War or other relics

Old, abandoned villages

2.- These sites will be marked and left undisturbed until their significance is assessed.

3.- With the consent and the co-operation of the landowners, buffer zones will be established around such sites.

4.- Should sites of cultural or archaeological significance be identified, the Provincial and National Government agencies concerned will be notified.

5.- Close liaison will be maintained with the landowners as the operations approach their villages to enable the Company to identify and protect any site of importance.

6.- All roading and logging crews will be periodically instructed on the importance of protecting these sites.

DO RESPECT CULTURAL AND SACRED SITES

Different people respect different things. Some sites might appear unimportant to outsiders, but they could be very important to the local people.

DO PROTECT OLD SITES AND RELICS

Old sites and relics cannot be "reconstructed" if destroyed, they are lost forever. They must be protected for the future generations.

DO NOTIFY YOUR SUPERVISOR OF ANY OLD SITE FOUND

If you come across any old village site, burial ground, warrelic, do not disturb it and tell your supervisor. The site might be important for the local people, for the history of PNG or of interest to tourists later on.

DO LISTEN TO WHAT LOCAL PEOPLE TELL ABOUT SITES OF INTEREST

When work reaches further, local people might remember or recognise forgotten sites. Listen to them and do not disturb such sites. Notify immediately the supervisor.

DO BE FRIENDLY AND POLITE TO EVERYBODY

Logging and timber industry should be profitable to everybody. The landowners get royalties and development, company employees get wages, housing, etc. Good relations help everybody.

DO NOT DESTROY ANYTHING WHICH MIGHT BE OF INTEREST TO THE PEOPLE

Caves, particular trees, sites might be of interest to local people. Do not destroy them, ask the supervisor before proceeding.

DO NOT HUNT

Local people regard all wild life as their property. Outsiders are not allowed to hunt it.

DO NOT FISH

Landowners regard all fish in the water as their property. Do not try to catch it.

DO NOT COLLECT FRUITS, NUTS OR OTHER MATERIALS

The landowners have sold only the commercial trees. All other trees, plants, animals in the forest are considered their property and outsiders might not be allowed to use it.

DO NOT ENTER GARDENS

Local people will resent uninvited visits in their gardens. **UNDER NO CIRCUMSTANCES SHOULD YOU HELP YOURSELF TO PRODUCE FROM GARDENS. THIS IS THEFT and could have grave consequences.**

DO NOT ENTER VILLAGES UNINVITED

The village people might resent the disturbance created by visits of uninvited outsiders.

ACKNOWLEDGEMENTS

The authors wish to acknowledge the interest shown by the management of Stettin Bay Lumber Company on Environmental Protection and the support given in the preparation of this manual, as well as for the research needed for the Environmental Plan.

The use of material from the following publications is acknowledged with thanks:

CAMERON, A.L., HENDERSON, L.E. 1979. Environmental Considerations for Forest Harvesting. CSIRO, Canberra.

Stettin Bay Lumber Company Pty Ltd, 1989. Environmental Plan for Talasea, Hoskins, Kapiura and Ania-Fulleborn Timber Areas.

UNITECH Development and Consultancy Pty Ltd, 1989. Scientific Reports for the Environmental Plan: Talasea, Hoskins, Kapiura and Ania Fulleborn Timber Areas.

収 集 資 料 一 覧 表

PNG の国情・経済一般

1. Development Policies and Strategies, 1990, 大蔵・企画省
2. Public Investment Programmes, 1991-1995, 大蔵・企画省
3. Annual Report 1989, PNG 中央銀行
4. Quarterly Economic Bulletin, June 1990, PNG中央銀行
5. General Economic Studies, Edit. Merran Van der Tak, 1989, INA
6. Trade and Industrial Policy in PNG, Edit. Merran Van der Tak, 1989, INA
7. Labour Studies, Edit. Merran Van der Tak, 1989, INA
8. Taxation Policy in PNG, Edit. Merran Van der Tak, 1989, INA
9. Gains, Losses, Fairness in Policy Choices, Jack L. Knetsch, 1989, INA
10. Essays in Development, P.T. Bauer, 1990, INA

投 資 動 向

11. National Investment Priority Schedule, NIDA

西ニュー・ブリテン州事情

12. Provincial Development Programme, 1989-1992, WNB政府
13. Estimate of Revenue and Expenditure, 1990, WNB政府

PNG 林 業

14. National Forest Policy, 1990, 林業省
15. Facts and Figures 1989, 林業省
16. Issues in PNG Forest Policy, 1982, INA
17. Log Export to Processing Policies, 1990, INA
18. INA Forestry Seminar, Nov. 1988, INA
19. Manual on Environment Protection Measures, 1989, SBLC
20. Proposed Environment Plan Guidelines (Forestry), 1990, DOEC

PNG 農 業

21. Livestock Development Corporation Future Development Study, 1990, 農業畜産省
22. Issues in Agricultural Policy, Agriculture Seminar, 1985, INA
23. Agriculture in the PNG Economy, Barry Show, 1985, INA

24. Agriculture Seminar; May 1989, INA
25. The Marketing of Cocoa & Copra in PNG, Ian Livingstone, 1989, INA
26. Issues in Customary Land Law, Robert Cooter, 1989, INA
27. Land Policy and Economic Development in PNG, Jack Knetsch, Michael Trebilcock, 1981, INA
28. Commodity Price Stabilisation in PNG, Edit. Brian Brogan, Joseph Remenyi, 1987, INA
29. Agriculture Studies, Edit. Merran Van der Tak, 1989, INA

JICA