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POLICY ISSUES ON COMMERCIAL FOREST MANAGEMENT

by

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INTRODUCTION

The Philippines expects to permanently maintain some forty six per cent (46%) of the country's total land area of thirty million hectares under permanent forest cover (Cortes, 1979). To achieve this, approximately six million hectares of inadequately stocked or degraded forest lands need to be restored with appropriate vegetative cover (PREPF, 1980).

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Thus, forest resource renewal and conservation schemes have focused on: (a) the strict enforcement of the selective logging system; (b) the conduct of reforestation by government; (c) the encouragement of industrial tree plantations, tree farms, and agro-forest farms by forest concessionaires and other interested individuals; and (d) the management of forest occupants.

This paper focuses on issues surrounding the management of Philippine commercial forests and hence, it deals with the forest destruction and renewal problems initially from the private point of view. Specifically, it highlights the economics of commercial forest management of natural forests and the tree plantations. Policy implications are discussed with simultaneous consideration of societal welfare, after which priorities for research are suggested.

ECONOMICS OF COMMERCIAL FOREST MANAGEMENT: The Natural Forests

The implementation of sustained yield management for the uneven-aged, dipterocarp forests of the country is through the selective logging system (SLS). Here, the removal of mature, overmature and defective trees is prescribed such that an adequate number of uninjured and healthy residual trees are left behind for a future crop of timber and forest cover.

The immediate goal of the SLS, accordingly, is to put the dipterocarp forest under regulation in order to have a second cyclic cut which is comparable in volume and quality to the old growth cut. It has three principal phases: (1) tree marking, (2) residual inventory, and (3) timber stand improvement. Tree marking is a means of insuring the needed number of trees for the future crop and seed trees that shall be left and protected from logging damages. In the residual inventory, which is done after logging operations, an evaluation is conducted of whether or not the loggers exercised care in avoiding damages to marked trees. Also this phase is done to determine the condition, sizes and number of healthy residual trees left. The healthy trees left will be the basis for predicting the volume to be harvested in the next given cutting cycle. The timber stand improvement is done to improve the number, growth and quality of the growing stock.

The licensees are encouraged to cut a volume that fluctuates with market conditions to maximize net returns from their investments. They are, however, constrained by the fact that they are only allowed to cut a volume that does not exceed their allowable cut. Relogging is prohibited and the second cut on the logged-over areas is permitted only at the end of the prescribed cutting cycle of the region where the concession is located.

Economic Efficiency of the SLS

Economic studies conducted on the SLS in the seventies indicate that the system is financially sound in the two logging set-ups analyzed (Rebugio, 1979). Net return per peso investment was calculated to be within 1.70-2.56. A later recalculation by Cabanayan (1980) which allowed for depressed log markets yielded lower figures of 0.2-0.7 only. Both studies have the following shortcomings, however: (a) the analysis considered only one cyclic cut instead of a perpetual series of cuts under sustained yield concpts and, (b) the third phase of timber stand improvement was excluded.

A more recent study conducted by Cruz (1982) analyzed SLS in its totality. Three logging areas in the country were examined to allow for site differences which influence yield and logging conditions, and consequently, revenue and costs. The main criterion used was the benefit-cost ratio, which appropriately takes into account the long time period and discounting effects. Figure 1 illustrates the specific factors considered in the study.

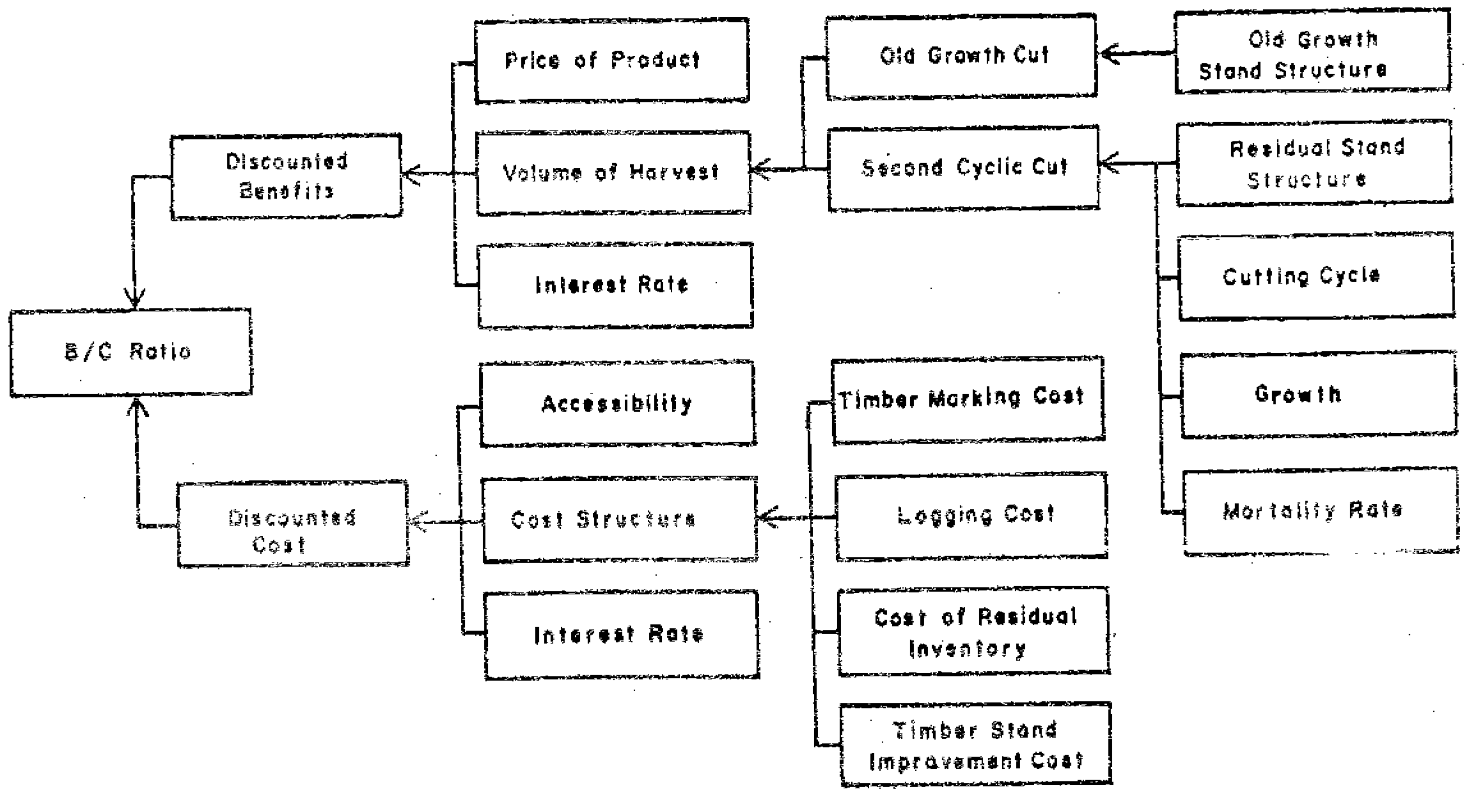

Fig. 1. Diagrammatic presentation of the factors which affect the efficiency of the selective logging system.

Source: Cruz (1982), p. 30.

Initial assumptions made include the following:

(1) The analysis period for the study areas is the length of their respective cutting cycles.

(2) Future growth of the untreated stands will be the same as that during the observation period.

(3) Expected mortality during the analysis period is 25 per cent.

(4) Yield in treated stands (or stands receiving TSI) is 20 per cent higher than the untreated stands.

(5) The cost incurred in practicing the selective logging system is the same as the cost of operation of the logging firms in the study areas.

(6) Costs and prices are constant within the analysis period.

(7) Rate of interest for the use of capital is 18 per cent.

(8) Timber marking, logging and residual inventory of a given working unit or logging setting is done in the same year.

The volume of the first cut (first cyclic cut) for the study areas was taken from the interview data but the volume for the second selection cut was determined by means of projections using the data from the Continuous Forest Inventory (CFI) plots of FORI. Appropriate statistical and forest biometry procedures were used in the analysis of the data.

To determine whether the system is economically efficient, the following conditions were set:

1. The analysis period for each study area is its cutting cycle, that is 35, 40, and 30 years, for Areas I, II and III, respectively.

2. Costs included in the analysis are those incurred in the aforementioned activities. The data obtained from the logging firms operating in the study areas were assumed to be reflections of the opportunity cost of the resources used in following the selective logging system. The logs produced by the system were valued at ₱650 per cubic meter; costs and log prices were based on 1980 levels.

3. By practicing the selective logging system, the logger is allowed to cut the harvestable volume at the end of the cutting cycle. The harvestable volume is equivalent to the permissible cut.

Benefit-cost analysis was conducted for a logging set-up, which on the average, is 15 hectares in area. The B/C ratio was computed using the formula:

$$B/C = \sum_{t=o}^{n} \frac{B_t}{(1 + i)^t} \div \sum_{t=o}^{n} \frac{C_t}{(1 = i)^t}$$

where: B/C is benefit/cost ratio; B_t is benefit received at year t; C_t is cost incurred at year t; i is the discount rate; n is the length of the cutting cycle; and t is 0, 1, 2, 3..., n years.

The benefit cost ratio and present net worth for a 15-hectare logging set-up in all areas as presented in Table 1 showed that Areas 1, 11 and 111 have B/C ratio of 3.47, 2.66, 2.37 respectively. However, it is the revenue from the first cyclic cut which influence heavily the present value of benefits. For all the areas, such returns comprise at least 99 per cent of the values of revenues.

Table 1

BENEFIT/COST RATIO AND PRESENT NET WORTH
FOR A 15-HECTARE LOGGING SET-UP, ALL AREAS

AREA	BENEFIT/COST RATIO	PRESENT NET WORTH (Pesos)
Area I	3.47	₱1,178,536
Area II	2.66	900,805
Area III	2.37	1,147,102

Source: Cruz (1982).

Economics of TSI

TSI is a component in the selective logging system and as such, should not be evaluated separately. Since this is a neglected phase in the system, an exploration of the economic explanation of why this is not performed in most logged-over forest areas was conducted.

It was assumed that TSI is a silvicultural operation that a logger may or may not perform. Thus, the benefits and costs when TSI is done are compared to the benefits and costs when it is not performed in logged-over areas. The benefits arise from the greater volume of permissible second cyclic cut from the treated stands. In arriving at the B/C ratio, the incremental discounted costs and benefits were derived using the same rate of discount used in the determination of economic efficiency. Costs and revenues in the first cyclic cut were excluded from the TSI analysis since they are sunk values relative to the question of whether one should do or not do TSI.

The analysis showed that among the three study areas, Area I has the highest B/C ratio (1.43). Area II has a B/C ratio of 0.44 and Area III has 0.62. The differences in the ratios could be explained by the differences on the TSI costs and the incremental benefits due to TSI. These indicate that an increased harvest cut in the distant future may not prove to be desirable considering the magnitude of the cost of obtaining it during an earlier point in time.

Sensitivity Analyses

Since there was a need to explore the implications of uncertainty surrounding the values of the parameters derived for the measures of economic efficiency as well as violations of the basic assumptions in the study, sensitivity analysis was conducted. In each of the study areas, all possible combinations of the following were evaluated: (a) 20 and 30 per cent decrease in the periodic annual increment (PAI) of diameter; (b) mortality rates of 30 and 40 per cent; (c) variations in the permissible second cyclic up to + 10 per cent over the untreated stands; (d) decrease in price of the product from ₱650 to ₱500 per cubic meter; (e) increase in interest rate from 18 to 24 per cent; (f) increase in truck hauling distance

+ 25 Km. and + 50 Km. over the average truck hauling distance of the firms that provide the cost data; and, (g) variations in the cost of + 10, + 20 and + 30 per cent of the cost incurred in the different phases of the selective logging system.

Results of the sensitivity analyses showed that variations in PAI, mortality rate and percentage increase of cuts over untreated stands resulted in negligible changes in the B/C ratios. But, variations in price, given the second cyclic cut conditions (PAI, mortality rate, and the per cent cut-over the untreated stands), cost, interest rate and hauling distance, affect the B/C ratios.

A price lower than ₱650 per cubic meter decreased the B/C ratio. Likewise, increased costs or longer truck hauling distance, while other factors were held constant also lowered profitability. All these are depicted in Table 2.

Table 2

SIMULATION ANALYSIS OF SELECTIVE LOGGING FEASIBILITY:
BENEFIT/COST RATIOS FOR VARIABLE SECOND CYCLIC CUT, PRICE, COSTS,
TRUCK HAULING DISTANCE AND INTEREST RATE[a/]

ITEM	BENEFIT/COST RATIO							
	Price/cu. meter = ₱650				Price/cu. meter = ₱500			
	+ 0 % in Cost	+ 10% in Cost	+ 20% in Cost	+ 30% in Cost	+ 0 % in Cost	+ 10% in Cost	+ 20% in Cost	+ 30% in Cost
Area I								
A. Truck hauling distance = 85 km.								
18% interest rate	3.47	3.15	2.89	2.66	2.66	2.43	2.22	2.05
24% interest rate	3.47	3.15	2.89	2.66	2.66	2.43	2.22	2.05
B. Truck hauling distance = 135 km.								
18% interest rate	3.03	2.76	2.52	2.33	2.33	2.12	1.94	1.79
24% interest rate	3.03	2.76	2.52	2.33	2.33	2.12	1.94	1.79
Area II								
A. Truck hauling distance = 55 km.								
18% interest rate	2.66	2.42	2.21	2.04	2.04	1.86	1.70	1.57
24% interest rate	2.66	2.42	2.21	2.04	2.04	1.86	1.70	1.57
B. Truck hauling distance = 105 km.								
18% interest rate	2.14	1.95	1.79	1.65	1.65	1.50	1.37	1.27
24% interest rate	2.14	1.95	1.79	1.65	1.65	1.50	1.37	1.27
Area III								
A. Truck hauling distance = 75 km.								
18% interest rate	2.37	2.15	1.97	1.82	1.82	1.65	1.52	1.40
24% interest rate	2.37	2.15	1.97	1.82	1.82	1.65	1.52	1.40
B. Truck hauling distance = 125 km.								
18% interest rate	1.97	1.79	1.64	1.52	1.52	1.38	1.26	1.17
24% interest rate	1.97	1.79	1.64	1.52	1.52	1.38	1.26	1.17

[a/] Benefit/cost ratios for a given price, cost, truck hauling distance and interest rate differ only in their less significant digits for all the variations in the second cyclic cut.

Source: Cruz (1982), Appendix Tables 27, 28 and 29.

Implications and Preliminary Conclusions

The Cruz study showed that the selective logging system is feasbile for the areas examined, even if full logging capacities were not achieved. The factor which heavily influenced the PNW in the study areas was the net revenue from the first cyclic cut. The present value of the net revenue from the second cyclic cut constituted only a very small portion of the present value of all the revenues. Since the second cyclic cut is made much further into the future, its value is much reduced when reckoned at the present time.

The insignificant influence of the net returns from the second cut has an important repercussion on the continuity of harvest from the forest. If a licensee conformed with the selective logging system, the residual stand could provide for the next harvest cuts. However, for a logger who has only a short planning horizon, more weight would be attached to net returns that are received in the present and less for returns in the distant future (the one from the second cyclic cut). Thus, the maximization of the net returns only from the first cut would be a very logical objective of a logger. A first cut that is heavier than the cut prescribed, that is, the case of overlogging, would reduce the residual stand that provides for the second cyclic cut. In this case, the objective of sustained yield from the forest may not be realized.

Hence, although the selective logging system was found to be feasible, the subsequent phase of TSI was not found to be economically attractive in the areas examined. This was due mainly to the difference in time when cost and revenue from TSI are incurred: cost at an earlier date, and revenue much later. Therefore, a rational logger would tend to liquidate at the first cut all the commercial volume in an area if there were no constraints on harvestable cut such as the annual allowable cut regulations.

The length of the cutting cycle affects the decisions of the licensees on some silvicultural and management prescriptions. Since a 25-50 year tenured logger is not allowed to do the second cyclic cut before the end of the first cutting cycle of 25-30 years, the required silvicultural treatments needing a cost outlay may not at all be practiced by a rational licensee unless he is also concerned with improvements in quality of the products forthcoming and, with some desirable biological and environmental attributes of the forest.

There is a need, therefore, to conduct an in-depth study of the rules and regulations relevant to the licensees. Among the growth variables to be examined closely are the effect of TSI on growth and yield, length of the cutting cycle, and the annual allowable cut. Also, to ensure continuity of harvest from the forest, effects of higher diameter cuts or other prescriptions in cut have to be evaluated.

Although the study dealt only with three areas, results may be applicable to areas with similar average old growth cut, stocking conditions in the logged-over areas, diameter growth and cost conditions, up to the range of sensitivity analyses conducted. But, for a wider range of application, similar studies should be done on a concession and not on a logging set-up basis. Here, tenure and area regulations could be dealt with more appropriately, along with other considerations such as taxes, forest charges and the like, which are collected from concessionaires. Moreover, effects of scale (dis)economies as well as externalities could be more appropriately accounted for by researches on larger areas.

Related Issues and Research Needs

An earlier study by the same author (Cruz, 1977) which looked into alternative management schemes for a given forest area point out the advantage, from the firm's viewpoint, of establishing plantation forests instead of maintaining a natural stand. The net present values for such alternatives which are presented in Table 3 indicate this.

Table 3

TOTAL NET PRESENT VALUE (P./ha) OF ALTERNATIVE FOREST STANDS

Rotation/cutting cycle, (years)	Accessibility Class				
	1RS	2RS	3RS	4RS	5RS
A. falcataria					
2	8655.80	7490.22	6325.59	5160.57	3995.66
3	9922.45	8248.47	7567.41	6386.25	6205.09
4	8980.06	7876.51	6837.60	5801.91	4764.72
E. deglupta Blume					
10	4246.24	3656.09	3112.26	2546.28	1979.48
11	4288.95	3702.27	3259.56	2688.63	2103.41
12	4125.14	3566.85	3043.71	2496.87	1951.14
Natural Stand[a]					
25[b]	-	-	-	-	-
30	-8.15	-14.21	-20.12	-26.10	-32.06
35	-25.53	-31.17	-36.73	-42.32	-48.21

Notes: [a] Old growth cut not included in the computation.
[b] Harvest is less than 60 cubic m/ha.

Source: Cruz (1977), Table 7.

Another alternative which has not been studied yet but which seems evident from the observed widespread violation of forestry rules is that of clearcutting or liquidating the forests. If the 1982 Cruz study implied a tendency for the firm not to practice timber stand improvement and, the adherence to SLS was found to be profitable, then one might expect that clearcutting would even appear much more profitable, from the private vantage point. It is, perhaps, no wonder then that despite the system of punishment being implemented (i.e., cancellation of license), a number of loggers, particularly those who do not intend to practice forestry as a long-term venture, opt for 'losing' the business.

Another problem related to the overharvest of timber is the inadequate protection of residual forests which becomes worse in the short run when licensees are cancelled. Encroachment of the unsecured logged-over areas which may be done by illegal loggers, kaingineros and speculators, leads to even more detrimental ecological consequences.

Such alternatives need to be evaluated from both private and public viewpoints because of forest externalities span across time and space. Thus, should more preference be attached to maintaining natural forests for ecological and posterity reasons, studies on the corresponding system of incentives should be given high priority. Such researches should simultaneously investigate: (a) the valuation of stumpage; (b) forest taxation for national and local revenue generation, (c) the effects of international trade concerns, and, more generally, (d) the system for enforcing forest conservation prescriptions.

As very often noted, the value of standing timber (or stumpage) has been inadequately estimated if forest charges and taxes are considered its proxy. Such fees paid by concessionaires have tended to be insignificant relative to output value (Table 4) and, inflexible with respect to variances in site conditions. It should be noted that underpricing of the resource leads to excessive rents; this results in wasteful use of the input (i.e., timber) as well as a tendency for overcrowding (i.e., proliferation of even the inefficient concessionaires). Both cause faster and destructive exploitation of forest resources. Thus, a recent attempt at piloting the stumpage appraisal system by the Natural Resources Development Corporation should be given more support, particularly because while the methodology has long been investigated for Philippine application (Serna, 1974) and positively endorsed (NRMC, 1980) its progress has been quite slow.

A related problem is the disposal of logs for the foreign or domestic markets. Price differences in both markets naturally affect the profits from logging. Along with the influence of uncertainty (e.g., about individual firm's log export quota) and the lure of quicker gains it is no wonder then that recent reports indicate large volumes of logs being illegally exported. Indeed, a more intensive study of the costs and benefits of the log export ban is in order. Needless to say, the study should take into account a wide range of considerations, such as economic and administrative feasibility as well as impacts on wood-based industries and the environment.

Table 4

CHARGES AND FEES OF EXPORTED TIMBER

	Average Amount Charged (₱/m3)	Price of Exported Timber (₱/m3)	Shares of Charges and Fees to Price
1965	1.85	94.0	2.0
1970	4.75	150.5	3.2
1975	14.45	216.7	6.7
1982	30.00	842.6	3.6

are bound to be significant and should also be evaluated. This becomes particularly important when the role of forest resources in the development of a region is studied. Here, case studies which uniformly examine policy tools such as local taxation, need to be conducted in such a manner that some generalizability could be done in the future.

All these imply the need to identify the incidence of benefits and costs associated with natural forest mangement schemes. Effects on private and social concerns, national and local priorities and, on intergenerational equity need to evaluated more fully for more responsive policy formulation.

PLANTATION FORESTS

Plantation forest management is relatively recent in the country. Thus, few studies have been conducted on their private feasibility as well as their significance on the social scale. The earliest studies were done on the PICOP tree farming project; more recent ones were in the nature of pre-project feasibility studies of proposed tree farming ventures.

The PICOP Tree Farming Project

The PICOP tree farming project involved the provision of inputs and technical knowhow to the participating tree farmers as well as the assurance of a ready market with PICOP as the major buyer. Since the project was intended to augment PICOP's own tree plantation, the company incurred minimal additional investment on infrastructure.

Mindajao's study (1978) on PICOP project participants and non-participants showed the following results: (a) initial participation is influenced by the availability of land which was used as collateral by those who availed of loans from the DBP; (b) threshold levels of education and income seemed evident - higher education or income before these levels were reached meant faster participation and slower otherwise; (c) for non-participants, the following constraints were cited: lack of suitable land and manpower as well as impatience about the gestation period of growing trees.

The economic feasibility of the PICOP project is depicted by Table 5 which was obtained from a more recent study on 20 per cent of the participating tree farmers. The figures show profitability from both private and public viewpoint, as well as depict the project's sensitivity to management practice, wage rate, and yield estimates.

Table 5

PROFITABILITY OF PICOP TREE FARMING: SCENARIOS OF ASSUMPTIONS FOR COST AND BENEFITS

Scenario	Silvicultural Practices	Daily Wage Rate	Yield (m^3/ha)	Boundary of Analy	Internal Rate of Return (%)[a/]
1	prescribed;	₱12.60	250	tree-far	17.9
2	prescribed	12.60	200	tree-far	9.6
3	prescribed	17.00	250	tree-far	1.3
4	prescribed	17.00	200	tree-far	10.0
5	actual	12.60	250	tree-far	31.2
6	actual	12.60	200	tree-far	21.6
7	actual	17.00	250	tree-far	12.4
8	actual	17.00	200	tree-far	0.2
9a	prescribed	12.60	250	society	17.9
b	prescribed	12.60	250	society	22.0
10a	prescribed	12.60	200	society	9.8
b	prescribed	12.60	200	society	13.7
11a	prescribed	17.00	250	society	10.8
b	prescribed		250	society	14.7
12a	prescribed	17.00	200	society	1.9
b	prescribed	17.00	200	society	5.5
13a	actual	12.60	250	society	21.9
b	actual	12.60	250	society	25.9
14a	actual	12.60	200	society	13.7
b	actual	12.60	200	society	17.5
15a	actual	17.00	250	society	16.0
b	actual	17.00	250	society	20.0
16a	actual	17.00	200	society	6.9
b	actual	17.00	200	society	11.0

Note: [a/] Figures presented by Hyman were rounded up for simplicity.

Source: Hyman (1981), Tables 1 and 8.

From the private point of view, the project appears to be viable when wages are lower than ₱17/labor-day, under actual silvicultural practices; viewed according to societal concerns, the project is likewise feasible. Hyman (1981) summarizes some of the more important lessons learned about the PICOP venture: (a) the need for financial assistance for harvesting; (b) adoption of the original model on agro-forestry to allow for earlier returns; and (c) the need for a periodic re-evalutation of tree loan size. In addition, the project design was such that the poorest households of the area could not participate; nevertheless the participants, who were mostly from the middle income class, experienced increases in their income.

Related Studies

As earlier discussed, the PICOP experience may be considered unique due to its pioneer nature, its being part of an already existing tree plantation and processing complex, and the availability of land for its participants. Thus, more complete studies which are relevant to the reforestation needs of denuded areas should include the following aspects: the establishment of infrastructure, marketing and processing facilities and, involvement of the poorer households in the area.

With respect to utilization, a study by Meimban (1982), for example, looked into alternative processing of the products of a giant ipil-ipil plantation into firewood, charcoal, or electricity-generation (dendro-energy). The benefit cost ratios obtained at 12 per cent discount rate were as follows: firewood production, 1.06; charcoal production, 1.2 and dendro-energy, 1.1 Since these ratios are not very divergent the final decision on how the ipil-ipil plantatin products was to be processed would have to rest on other criteria such as local basic needs.

A related concern would be the market structures at the harvest and utilization stages. Where the industry tends to be monopsonistic or monopolistic pricing tends to be inequitable, at least as far as the local communities are concerned. These are bound to be significant because of the large scale of industry operations relative to the size of the host province, or even host region.

In the case of involvement of the poorer households, such as the shifting cultivator, more studies need to be conducted to ascertain the factors leading to the integration of upland residents into the development process. A preliminary attempt at this was conducted by Corpuz (1981) who found that a traditional shifting cultivator could expect higher returns from his upland farm than from establishing a tree farm of the PICOP type. The calculations made were again largely influenced by the difference in the timing of revenues and costs which was magnified by the effects of discounting.

Current Industrial Tree Farming Projects

As a result of the various incentives which the government is giving to tree farm projects (Annex Table 3), a considerable area has been granted as leases. Table 6 shows that in 1981 industrial tree plantations composed the majority of such leases each of which cover at least 100 hectares, and which are planted to tree crops for the raw material requirements of wood processing plants. Agro-forest farms are granted for a minimum areas of 100 hectares for combined agriculture and tree crops; tree farms, on the other hand, cover a minimum area of 10 hectares, and are to be established for tree crops. The figures presented do not include projects under the new Social Forestry Program which focus on the uplan communities.

A partial list of the approved industrial tree farm is presented in Table 7 for discussion purposes. It may be noted that hardwood species are included in some of the projects; these also involve longer gestation periods.

Table 6

INDUSTRIAL TREE PLANTATION, TREE FARM AND
AGRO-FOREST FARM LEASES IN 1981

	Number	Area (ha.)
Industrial Tree Plantation	24	116,894
Tree Farm	105	11,110
Agro-Forestry Farm	19	12,220
TOTAL	148	140,224

Source: BFD, Philippine Forestry Statistics, 1981.

Table 7

EXPECTED FEASIBILITY OF INDUSTRIAL TREE FARM PROJECT PROPOSALS APPROVED AS OF 1983

ITP #	Gestation Period (Yrs)		ROI (%)	ROE (%)	IRR (%)
1	10		1.4	1.7 over a 10 yr. pd.	-
2	11	(pulpwood)	-	29.30	21.74
	16	(sawtimber)			
3	4	(ipil-ipil)	-	-	-
	6	(a. falcataria)			
4	5	(ipil-ipil pulpwood)	-	15.91	12.54
	11	(bagras pulpwood)			
	21	(bagras sawtimber)			
	13	(caribbean pine pulpwood)			
	25	(caribbean pine sawtimber)			
	21	(benguet pine sawtimber)			
5	5		6.8 over a 25 yr. pd.	-	-
6	14	(mahogany)	16.7 over a 16 yr. pd.	-	-
	8	(a. falcataria)			
7	9		14.5	-	-
8	8	(pulpwood)	-	-	27.63
	12-16	(sawtimber)			
9	5		42	-	-
10	14	(mahogany)	5.5 over a 16 yr. pd.	-	-
	8	(a. falcataria)			
11	16	(bagras)	-	-	32.3
	8	(a. falcataria)			
	5	(ipil-ipil)			
12	8	(a. falcataria)	60.7	151	-
	14	(mahogany)	(simple ROI)	(simple ROE)	
	rotation period will be every 30 yrs. for dipterocarp				
13	5	(ipil-ipil)	-	-	32.82
	16	(caribbean pine)			
	8-12	(others			
14	12-28	(sawtimber)	-	-	-
	5	(fuelwood)			
	8	(raw materials)			
15	4	(ipil-ipil)	-	-	-
16	5	(giant ipil-ipil)	-	-	-
17	11		15.9 over a 30 yr. pd.	-	-
18	4	(ipil-ipil)	48	-	18.49
	20-30	(mahogany; narra)	(simple ROI)		
19	3	(bagras for banana propping poles)	28.5 over a 10 yr. pd.	-	-
	20-30	(mahogany, narra - logs)			

Source: National Industrial Tree Corporation and Bureau of Forest Development, January 1984.

No computation for the internal rates of return for most of the projects with the longer gestation periods are provided in this list. The fact, however, that these projects have been approved implies the importance attached to establishing plantation forests of the hardwood type, even of lower IRR's may be expected.

Policy Issues

The more important problems confronting the establishment of man-made forests are: The costs involved and corresponding financing required; participation by the upland communities; and, technical feasibility of plantation projects.

While government reforestation work had accelerated in the last decade, doubts have been expressed on whether the government could afford to shoulder the cost of reforesting degraded lands (Sanvictores, 1979). Thus Monsalud (1977) proposed for reforestation work by the Bureau of Forest Development to be supplemented by a quasi-government agency. It was likewise suggested that funds he generated through additional forest charges on concessionaires and licensees. In fact, the recent establishment of the National Industrial Tree Corporations (NITC), a subsidiary of the National Development Company (NDC), is a step in this direction. NITC is currently negotiating for low interest loans from foreign lending institutions which could be lent out to industrial tree farming projects at very low rates; evaluation of the rates to be charged is on-going.

A different approach to the simultaneous solution of the problems of costly reforestation and poverty in the uplands has been suggested by Revilla (1983a) in a paper on the COSTEF system, or cost-effective reforestation/agro-forestation strategy. The creation of a reforestation trust fund from which a COSTEF cooperator draws an annual stipend and subsequent larger amounts upon completion of a reforestation/agro-forestation project is suggested. The source of such fund is initially conceived to be the reforestation/agro-forestation budgets of concerned agencies. The paper moreover posits that lower costs per hectare would be entailed relative to what the private sector has been quoting (e.g., about ₱14,000 per hectare in 1983).

Indeed, the involvement of upland communities in the forest renewal efforts of the private sector needs to be studied in more detail. During informal conversations with some representatives from the private sector, wariness to deal with upland residents was cited as a reason for not proposing renewal projects far from their concessions.

And, in a particular case, the establishment of a large tree farming project in Northern Philippines did not initially result in serious conflict between the project implementors and the local populace (Aguilar, 1983). In this respect unchecked inequitable, differential access to reforestation ventures may even result in increased instability in the uplands.

With respect to the technical feasibility issue, more care needs to be exercised in the preparation of yield estimates for forest renewal activities. Apprehension on over-estimates of future yield from ipil-ipil dendro-energy farms and the consequent effects of the feasibility of wood-based electricity generating plants and encroachment on the remaining forest cover have been expressed.

Recent estimates by Revilla and Gregorio (1983) reveal yearly yield from leucaena plantations to range from 15 to 25 cubic meters per hectare, or only around 35 to 50 per cent of yield predictions made by earlier researchers. Such lower productivity figures were obtained from an adequate number of plots in actual forest conditions, unlike the earlier measurements which were made on experimental plots under highly favorable environments. Indeed, even in other types of forest plantations, yield predictions have tended to be optimistic. Thus, Hyman (1981) for example points out the downward adjustments made made for albizzia falcataria plantations.

Moreover, ecological concerns also needs to be addressed, particulary in terms of the high risk involved in the conversion of multi-specied, uneven-aged stands to uneven-aged, single-specied forests. Table 8, for instance shows the phosphorous draining effect

Table 8

INDICATORS FOR SOME ENVIROMENTAL EFFECTS
OF DIFFERENT UPLAND ECOSYSTEMS AT
PUTING LUPA, MT. MAKILING

	Secondary Forest	Plantation Forest	Three-Year Old Kaingin	New Kaingin	Grassland
(1) Acidicty (ph)	5.2	n.a.	6.1	n.a.	5.5
(2) Organic Matter Content (Per Cent)					
(a) 0-15 cm. depth	3.0	n.a.	2.4	n.a.	2.9
(3) Net Gain in Phosphorous (kg/ha./yr.)	+52.6	-56.8	-78.7	-45.9	+35.4
(4) Diversity of Insect Species	908	454	67	n.a.	202
(5) Per cent of Total Average Run-off due to rainfed:					
(a) light rainfall, unsaturated soil	9.1	11.5	9.7	11.7	5.1
(b) light rainfall, saturated soil	8.6	10.3	10.7	12.5	4.1
(c) heavy rainfall, unsaturated soil	18.4	19.8	14.4	17.5	17.3
(d) heavy rainfall, saturated soil	63.8	58.5	65.2	58.2	73.5
(6) Change in Sediment Load Due to Precipitation Intencity Changes (Per cent)	12.3	21.3		6.4	n.s.

Sources: Upland Hydroecology Program (1977), Tables 1, 2 & 6; pp. 20-24, Appendix Table 1 and, Figure 34a.

Upland Hydroecology Program (1978), Appendix Table 9, p. 30.

of an ipil-ipil plantation, compared to that of the secondary forest. For comparison purposes, the same table presents the other forest land uses and their environmental effects.

GENERAL ISSUES FOR DISCUSSION AND RESEARCH NEEDS

A common problem in the management of both natural and plantation forests is that of determining the distribution of costs of degradation and, of attempts at reversing it through the selective logging system, reforestation by concessionaire, contractor, or upland resident, and management of forest occupants.

Studies on the externalities of forest practices need to be conducted such that some monetary evaluation may be feasible. The latter would be pre-requisite to attempts at identifying the specific economic tools for sharing the benefits of conservation measures. Such tools, for example, may include: taxing a low-lander whose irrigated farm is benefited by a nearby uplander's well-conserved farm and using the tax to pay the latter (Panayotou, 1983) or, including the environmental value of forests in the fees paid by timber concessionaires.

Attendant to such studies is the determination of an appropriate system of incentives for conservation and disincentives to overcutting. Gregory (1972) for instance, outlines the various types of taxes and their effects on conservation, e.g., a real property tax collected regularly discourages conservation while a yield tax has a lesser similar effect.

Concomitant studies would be those on the incidence of taxes, their effects on the wood processing industry, and the local municipality directly affected by forest-based activities. It may be worthwhile to investigate, for example, means of encouraging local residents to protect the logged-over areas from encroachment, by allowing them to be part-owners of concessions and, who are thereby interested in sustainable timber exploitation. In this respect studies on: (a) the effectivity of the Revised Forestry Code's provision on the licensees' selling 10 per cent of their subscribed capital stock to employees, laborers and the general public and, (b) the real property taxes paid by concessionaires to local governments are suggested.

Related to the taxation issue is a parallel problem in the inter-temporal sense - that of determining the appropriate discount rate for forest-based activities. As may be gleaned from the earlier discussion, positive discounting had the following effects: (a) reducing the attractiveness of timber stand improvement, (b) increasing the relative profitability of plantations over natural stands, and (c) minimizing the attractiveness of tree plantations versus agricultural crops for shifting cultivators. Moreover, factors which affect the forest user's time preference rate, such as uncertainty due to political problems in the uplands, fast changing rules and regulations, and restrictive tenure limits need to be simultaneously examined.

Parallel investigation of the capital intensity of various types of forest based activities also needs to be done in order to maximize employment and possibly, to encourage more conservation practices. Indeed, a preliminary investigation of technology in Philippine forestry depicted use of some equipment which were not only labor displacing but were also destructive (Laarman et al., 1981). Moreover, reforestation work in general has been noted to be labor intensive. Thus, care needs to be exercised in outright lowering of the interest rate, or cost of capital, to encourage tree plantations; such may result in the unfavorable adoption of labor displacing tree planting technologies now available in most developed countries.

In general, the studies included in the review above as well as in an earlier literature survey (Segura-de los Angeles, 1982) are not policy-oriented. They usually focus on private concerns and, while deriving some policy implications, do not provide enough information necessary for a more comprehensive policy analysis. This is partly due to the specificity of the studies' findings to the cases being investigated. Thus, while the advantages of case studies merit their conduct (e.g., localized effects of certain activities), in the future, they should at least investigate critical variables which are deemed important for certain policy decisions. If so conducted, such studies would provide important additional information to those gathered through macro-level researches.

Annex A

THE ANNUAL ALLOWABLE CUT FORMULA

For areas with approved timber/forest management plan, the annual allowable cut formula is (BFD Administrative Order No. 74, Series of 1974):

$$c = \frac{V_o A + V_r A}{2cc} \times f$$

where:

c = annual allowable cut

V_o = 55% (Vol. of 70 cms. dia. trees) + 25% (Vol. of 60 cm. dia. trees) + Vol. of 80 cm. and larger trees, based on virgin forest inventory.

V_r = same formula as V_o, except that the residual trees at the end of the cutting cycle are used.

A = Total operable area

f = recovery factor (70% pending determination of timber utilization efficiency)

cc = cutting cycle.

Annex Table 1

AREA, AAC, PRODUCTION AND EXPORTS OF TIMBER LICENSEES

	1960	1970	1980	1981
Area (Mil. ha.)	4.5	9.4	7.9	7.7
AAC (Mil.cu.m.).	7.5	15.5	16.8	14.9
Log Production (Mil.cu.m.)	6.3	11.0	6.3	5.4
% Log Production to ACC	84.4	71.0	37.8	36.1
Log Export (Mil.cu.m.)	3.4	8.6	0.7	0.7
Per cent of Exports to Production	53.9	78.3	11.2	13.1

Source: Bureau of Forest Development, Forestry Statistics, various years.

Annex Table 2

SUMMARY OF COSTS INVOLVED IN THE DIFFERENT PHASES OF THE SELECTIVE LOGGING SYSTEM, 1980 PRICES

ITEMS OF COST	AREA I	AREA II	AREA III
		PESOS	
A. Tree marking cost, per ha.	76.69	81.15	505.43
Labor cost	68.83	71.45	283.42
Spare parts and materials	.89	1.21	11.35
Overhead cost	6.97	8.49	209.66
B. Pre-harvesting			
1. Road location, survey and timber cruising, per ha.	47.17	53.74	262.65
Labor cost	37.27	40.11	125.26
Fuel and oil	5.00	-	1.64
Spare parts and materials	-	6.12	9.88
Overhead cost	4.39	7.51	125.87
2. Road construction, per km.	203,900	149,923	110,627
Labor cost	25,251	10,299	10,495
Fuel and oil	122,742	37,956	44,159
Spare parts and materials	37,371	75,625	39,880
Overhead cost	18,536	26,043	16,093
C. Harvesting cost,[a/] cu.m.	73.17	47.28	51.50
Labor	22.43	16.08	15.67
Fuel and oil	27.49	11.07	16.55
Spare parts and materials	23.25	20.13	19.28
D. Hauling cost, per cu.m./km.	.54	1.17	1.09
Labor	.03	.04	.32
Fuel and oil	.23	.24	.28
Spare parts and materials	.28	.89	.51
E. Residual inventory, per ha.	19.17	24.61	168.15
Labor cost	17.21	19.99	94.48
Spare parts and materials	.22	1.63	3.73
Overhead cost	1.74	2.92	69.89
F. Timber stand improvement, per ha.	94.24	94.24	503.13
Labor cost	25.67	25.67	362.17
Fuel and oil	-	-	25.89
Spare parts and materials	60.00	60.00	52.72
Overhead cost	8.57	8.57	62.43
G. Stumpage cost, per cu.m.	30.00	30.00	30.00
H. Logging overhead cost, per hectare	2,030	4,285	6,527

[a/] Except truck hauling cost and overhead cost.

Source: Cruz (1983), Table 5.

Annex Table 3

LIST OF INCENTIVES FOR INDUSTRIAL TREE FARMS,
AGRO-FOREST AND TREE FARMS

(1) trees belong to lessee with right to sell

(2) first priority to licensee till period of availment has elapsed; then declared open

(3) nominal filing fee ₱.50/ha.

(4) no rental first (5) years; 6th-10th year, annual rental of ₱.50/ha.; thereafter, annual rental of ₱1.00/ha. if long denuded, after 25 years, first 5 years ₱.50; thereafter ₱1.00/ha.

(5) forest charges = 25% of regular forest charges of NIRC.

(6) exempted for: % tax in Title V of NIRC, all forms of sales taxes, local municipal taxes, and real property taxes (PD 853) withholding tax at source upon interest paid on borrowings.

(7) all expenses = ordinary and necessary business expenses or capital expenditures

(8) BOI pioneer area

(9) priority in securing credit assistance

(10) exempted from PD 1153

(11) assurance of links of processing plants

(12) product may be exported

Annex Table 4

PERMISSIBLE SECOND CYCLIC CUT FOR TREATED AND UNTREATED STANDS FOR ALL AREAS OF THE CRUZ STUDY

Area	Permissible Second Cyclic Cut (cu.m/ha.)	
	Treated Stands	Untreated Stands
Area I	264.5	220.5
Area II	139.5	116.3
Area III	212.4	177.0

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