Philippine Institute for Development Studies
Working Paper 81-01

RESEARCH ON FOREST POLICIES FOR PHILIPPINE DEVELOPMENT PLANNING: A SURVEY

by

MARIAN SEGURA-DE LOS ANGELES

April 1981
Philippine Institute for Development Studies

TABLE OF CONTENTS

List of Tables

List of Figures

RESEARCH ON FOREST POLICIES FOR PHILIPPINE DEVELOPMENT PLANNING: A SURVEY

by Marian Segura-de los Angeles

INTRODUCTION

Special Characteristics of Forest Production

Forests may be distinguished from other natural resources in terms of their potential renewability and their being land-intensive. The production of forests is largely dependent on timber production which in turn have the following peculiarities relevant to forest management (Gregory, 1972):

(1) immobility of standing timber

(2) long time period involved in production

(3) dual nature of standing timber

(4) high ratio of inventory to annual production

(5) flexibilities in production and marketing

(6) aggregative nature of forests

(7) externalities

Immobility refers to the standing tree which has economic value, or "stumpage". The activities of cutting and transporting the trees to a market, or logging, is necessary for the conversion of stumpage into more usable forms. Thus, in addition to the fact that growing

stumpage entails the use of resources and must earn a return to the forest grower, so must the economic activity of logging be accrued its due returns. Valuations of such returns have implications on the pricing of the tree which are to be cut and removed from the forest: they may differ widely when the forest grower is not the harvester/logger, as in the case of Philippine forests.

Compared to most productive activities, that of growing trees requires relatively longer time periods, and more so when the trees are of the hardwood species. Philippine dipterocarp forests, or hardwood-producing forests which constitute ninety per cent of the country's forests, have evolved over generations of adaptation to the bioclimatic conditions of the tropics. Being so, due consideration of time as an important input to the production of dipterocarp forest should be made with respect to harvests and the conduct of forest renewal activities.

Such time intensity of forest production is compounded by the dual nature of standing timber: "The standing tree is at once the final product and the factory which produces that product." A decision to harvest the product is thus also a decision to temporarily liquidate the producing factory.

Concomittant with long forest production periods is the high ratio of inventory to annual production. That is, forest growing stock relative to its growth is high. This implies that outlays to preserve or improve the growing stock on activities such as forest protection and silvicultural treatments may need to be made.

Flexibilities of production and marketing come in varying degrees. On the one hand, there is the one-way flexibility in terms of the long time period involved in growing stumpage and the short time it takes to covert them into logs. On the other hand, there are also the multiple flexibilities in forest management in terms of: (a) the ability to extract multiple products from forests and trees, and, (b) the ability to postpone harvest and still produce the same goods and services.

The aggregative nature of forests means that trees should not be treated individually, but as a whole community growing within a set of ecological conditions. Since trees grow "aggregatively" and in the process use up large tracts of land, communities surrounding a forest area are significantly affected by forest activities. In addition, the other services that forests produce which are non-timber are also important. These include the following: recreation, completion of the hydrological cycle, habitat for wildlife, scenery, and the like. The problem of managing forests therefore also entails management of these other products and services.

Broad Forest Management Issues

The question of how benefits and costs from using a potentially renewable resource such as forests could be optimized for the Philippine economy can therefore best be initially understood by recognizing that policies affect forest management through their impact on physical, economic and institutional considerations in resource conservation.[1/] More concretely, these considerations include: physical and economic supply of forest products and services; demand for such products and services; control of resources used in forest production; and market mechanisms.

Policy issues which are relevant to such considerations may be analyzed from two viewpoints: those of the individual components of the economic system, such as the producers and consumers; and those of society in general. Though Philippine forests are publicly owned, they are used privately under a system of granting concessions, licenses, and permits. Their management therefore is a co-management basis, where government impose controls on the manner in which forests are used by private individuals. The main objectives of co-managership are: "(a) to promote greater efficiency in the exploitation

---

[1/] The term "conservation" here is broadly defined as "wise use" of a resource, following Ciriacy-Wantrup (1963).

and use of timber and other forest resources; (b) to promote stability and growth of the forest industries so that they may provide continuing employment to the rural communities and help improve the quality of life in these areas." (Reyes, 1978). Effectiveness of conservation concepts and policies therefore depend on explicit recognition of such objectives in the private and public terms, which, at times may not be in harmony with each other.

Scope of the Study

This review will therefore focus on specific public and private forest management issues in terms of how peculiarities of timber are incorporated into forest decision-making. Physical, economic, and institutional considerations are treated simultaneously in dealing with such issues. Of course, discussions will revolve around basic economic principles of supply and demand.

Part I focuses on forest management for timber production. It looks into intertemporal allocation of access and use of timber factors which have led to overcutting of trees, and/or lack of forest renewal activities. Part II tackles some important issues of the forest renewal problem which have bearing on policy-making while Part III focuses on multiple use forestry. Part IV tackles the wood processing industries. Part V then synthesizes the research issues raised in the first three parts and also summarizes forest policy bottlenecks for the country.

PART I

ECONOMICS OF TIMBER PRODUCTION

Economic literature on the exploitation of a potentially renewable natural resource focuses on the following interests: (1) the derivation of an optimal rate of resource use under certain optimization criteria, and (2) the effect of various market characteristics and resource use criteria on the long-run stock of the resource. Relevance of such concerns to sustained production from forests arise from at least three important characteristics of timber production: potential renewability, long renewal periods, and externalities involved in forest use.

A. THE OPTIMAL HARVEST AGE OF FORESTS

Economic Theory of Forest Harvesting

Interests among economists and forest managers on resource harvest rates initially developed around the non-optimality of the maximum sustained yield (MSY) theory earlier advocated by most natural scientists as guide for determining resource use rates. Briefly, the MSY theory says that the stock of a resource must be maintained at a level of maximum sustainable productivity. In forestry terms, this means arriving

at a rotation or cutting cycle which maximizes maximum total yield.[2/] The following variations of this theory include revenue and cost considerations as: (a) maximizing mean annual revenue; and (b) maximizing mean annual net renenue (excluding interest charges).

Expressing yield in revenue terms, the rotation periods chosen following these criteria may be depicted graphically as follows:

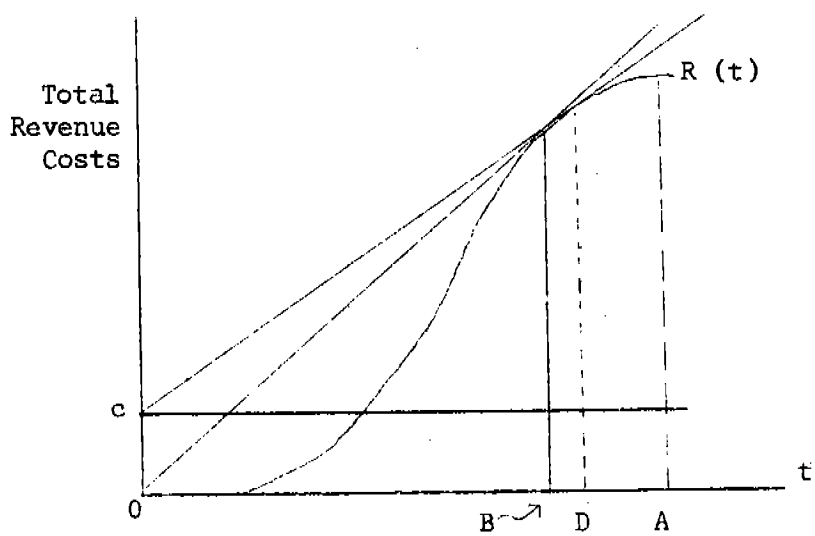

Figure 1. The zero interest models of financial maturity.

Here, the total revenue curve follows the shape (and corresponding marginal productivity characteristics) of the usual total

---

[2/] "Rotation" means the period of years required to establish and grow timber to a specified condition of maturity. The specific term used for uneven-aged forests is "cutting cycle".

product curve, where time (t) is the variable input. Note that the total revenue curve, R(t) does not emanate from the origin; this is because economic yield from timber production can be expected only after some degree of maturity has been reached by the forest stand. OC represents regeneration costs.

The rotation period OA is arrived at when total revenue is maximized; OB when average annual revenue is maximized; and OD when average net annual revenue is maximized. Because such harvest criteria neglect the opportunity cost of locking capital into standing timber for a considerable span of time, they have been called "zero interests" models.

Due consideration of capital cost came with the development of the various optimization criteria under various assumptions, as shown by formulas 1-5 in the following table reproduced from Bentley and Teeguarden (1965). The three "zero interest" models are also included for comparison purposes (formula 6-8).

Table 1. Some Financial Maturity Models[a/]

Solution	Expression Maximized	Special Assumptions
1. General present net worth	$\pi = \frac{R(t)-C(1+i)^t - [L(1+i)^t-L]}{(1+i)^t - 1}$	Manager fixed
2. Faustmann's soil rent present net worth or land expectation value	$L = \frac{R(t) - C(1+i)^t}{(1+i)^t - 1}$	Land fixed
3. Duerr's present net worth	$[R(t)/(1-i)^t] - C$	Manager fixed; land value is zero; one rotation
4. General internal rate of return	$i_a = \sqrt[t]{\frac{R(t) + L}{C+L}} - 1$	Capital fixed
5. Boulding's internal rate of return	$i_a = \sqrt[t]{\frac{R(t)}{C}} - 1$	Capital fixed; land value is zero
6. Maximum total revenue	$R(t)$	Interest rate is zero; one rotation
7. Average annual gross revenue or mean annual value increment	$\frac{R(t)}{t}$	Land fixed; interest rate is zero; no regeneration cost
8. Forest rent or average annual net revenue	$\frac{R(t) - C}{t}$	Land fixed; interest rate is zero.

[a/] For purposes of simplication, intermediate costs and revenues are not reflected in these models.

Notations used are as follows:

t = rotation length

$R(t)$ = revenue from harvest in year t

$C(t)$ = cost function

i = interest rate

i_a = average interest rate (or internal rate of return)

L = land value

π = return to the entrepreneur

The first five models differ in terms of: fixity of and returns to production constraints, and, maximization over one rotation versus an infinite number of rotations. The general present net worth model, (equation 1) assumes that the forest enterprise has access to all factor markets; it awards land its market price and maximizes all economic surplus that goes to the entrepreneur. The Faustmann model (equation 2) assumes land as fixed, and maximizes all economic surplus to it. Both models assume an infinite number of rotations.

Duerr's present net worth (equation 3) maximizes over one rotation period, returns to the entrepreneur. The internal rate of return models (equations 4 and 5) maximize the rate of return to capital and differ from each other only in terms of the inclusion of land values.

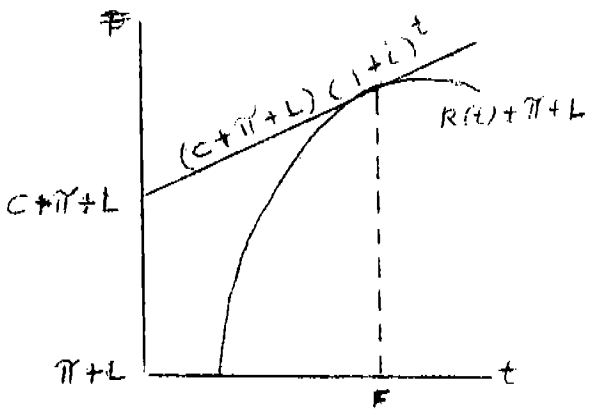

Fig. 2a. The General Present Net Worth Model

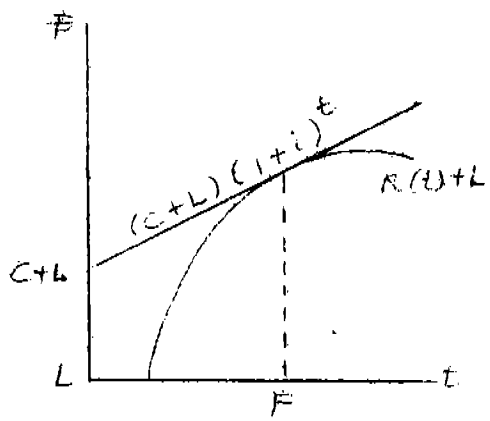

Fig. 2b. The Faustmann or Soil Rent Model

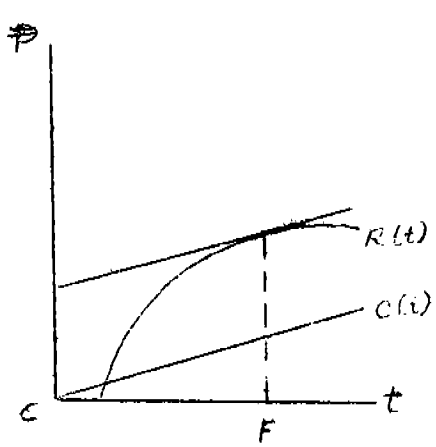

Fig. 2c. Duerr's Present Net Worth Model

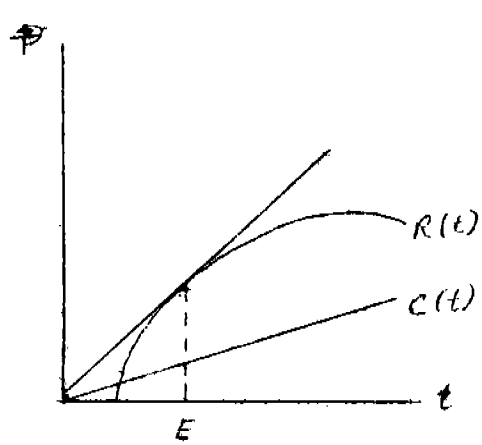

Fig. 2d. The Maximum Internal Rate of Return Model

N.B.: All Y-axes are in logarithmic scale.

The most accepted and widely used among these five models are the first three, although controversy on which return to maximize still continues.[3/] Such controversy revolves around whether timber growing can be viewed as one which can compete with other economic ventures in terms of capital efficiency. The five criteria vary in terms of which constraints the forest manager is faced with, and the time frame he is considering for managing the forests. When land is the constraint, then it would be economically sound for him to maximize land expectation value (equation 2); when capital is the constraint, the internal rate of return models would be more applicable (equations 4 and 5).

However, equations 4 and 5, which represent return to capital have been argued to be inapplicable for forest growing, because the latter is said to be unable to compete with normal economic activities due to its time-intensity. Moreover, for countries where population growth exerts a lost of pressure on the land, as in the LDCs maximization of land expectation value has been advocated. Thus, most calculations in forestry decisions have been based on the use of rates of interest which are lower than the market rate of interest,

---

[3/] See for instance, the articles of Thompson (1966), Holt (1976), Smith (1967), Samuelson (1979) and Myers (1977). The second and third models are actually variations of the general present net worth model.

and which generally approach that of a social discount rate (Ferguson and Reilly, 1976). A rate which would be conservation oriented would be in the vicinity of 5% (Myers, 1977).

The problem of deciding on the exploitation rate of renewable resources from society's point of view has been treated in the following manner: (1) using a safe minimum standard to avoid adverse ecological effects of overexploitation; (2) analyzing resource systems under steady state conditions; (3) operationalizing resource use decisions by looking into adjustments between supply and demand. Implied in all these is the desire to preserve the positive environmental influences of forests, and the need to consider intertemporal/intergenerational equity in access and use of a potentially renewable resource.

Ciriacy-Wantrup (1963) advocated that as a general rule, a limit to the exploitation of potentially renewable resources must be set to prevent impairment of its biological renewal. This implies a criterion which avoids a critical zone beyond which resource depletion becomes irreversible.

Analysis of resource use using steady state systems may be categorized as follows: (a) those which use dynamic optimization models to derive steady - state conditions, and (b) those which use

a static framework, with the steady state conditions as given.

Among those who use dynamic optimization models are Plourde (1970), Burt and Cummings (1970) and Beddington, Watts, and Wright (1975). Plourde uses the calculus of variations in dealing with the problem of the use of a social discount factor vis-a-vis optimality in resource exploitation. Burt and Cummings examine production and investment in natural resource industries and optimize a social welfare function as well. Beddington, Watts and Wright have, as their objective function, the maximization of the present value of the profits obtained from selling the harvest from the resource, using optimal control theory under various combinations of the following conditions: (a) the resource is harvested from a common or private pool, and (b) there is perfect competition or monopoly power in the resource market. Among those using a static framework is Smith (1968) whose work deals mainly with fisheries exploitation. In the case of forestry Naslund (1969), Schreuder (1968) and Samuelson (1979) are among those who have made important contributions to the problems of determining forest exploitation rules. Naslund and Samuelson both come up with a rule which generalizes Faustmann's formula (which has become known as the traditional forest regulation model).

The more important thing to point out is that such models try to incorporate the decision of resource exploitation into more general problems such as the rate at which capital is to be accumulated over time, consumption rates, population growth rates and intertemporal allocation of forest use. Thus, they come up with derivations of sustained yield in a similar fashion as economists have treated growth via golden rules and modified golden rules (Plourde, 1970). For this reason the term "economic sustained yield" has replaced mere "sustained yield".

The operationalization of such concepts which link harvesting decisions with national supply, demand, and growth considerations was recently conducted by Walker (1975) in his formulation of ECHO (economic harvest optimization). Basically, ECHO incorporates supply and demand concepts with timber growth and renewal. The amount of timber to harvest, investments needed for intensive forest management, and allocation of land for commercial timber production were simultaneously determined for national forests in the U.S. Although these could also be done using Faustmann's approach (as pointed out by Gaffney (1960), ECHO is more flexible in terms of handling downward sloping demand curves.

The Philippine Case

Philippine forest management aims to promote optimum sustained yield, which is defined as follows (P.D. 705; P.D. 1559): "...continuous or periodic production of forest products in a working unit for the purpose of achieving at the earliest practicable time an approximate balance between growth and harvest or use."

As expounded by Revilla, (1977) the following are the elements of sustained yield: continuity of harvests; the periodic time interval during which the products are obtained; and the area on which sustained yield is to be practiced. This is supposed to have the following results: (a) forest conservation for the benefit of future generations; (b) amelioration of uncertainty in the forest industries; (c) stabilization of communities; (d) provision of regular incomes; and, (e) protection of social values.

In the same paper, Revilla points out the following:

(1) the area basis for sustained yield may be the nation, the region, or a forest management unit,

(2) forest management, being an economic activity, should explicitly consider economic considerations, such as growth and profit in the case of the firm;

(3) "a forest unit in a given situation either makes an economic sustained yield unit or it does not."

Revilla, thus, proposes a reinterpretation of the sustained yield concept into an economic sustained yield concept. He adds that the factors which make (or do not make) an area an economic sustained yield area, such as the size of the area vis-a-vis its ability to meet the demand for goods and services, and, the economic constraints, may be manipulated to allow for sustainability.

Indeed, explicit recognition and consideration of the economic forces which govern forest use seems to be in order. In fact a brief examination of such forces which lead to forest overcutting (Section B below) bear this out. Such study will have to be conducted both at the forest management unit level, and from the standpoint of the nation. For the latter, economic concerns shall be the broader issues of Philippine supply and demand for various forest timber products and services, foreign trade, and the like.

In fact, the only comprehensive treatment of the country's alternative futures with respect to Philippine forest use is the PREPF study (1977), which focused on the determination of physical supply of forests and demand for major Philippine timber products. This study reveals that problems between balancing potential timber supply and local need for wood products would not be felt between now and 2000 A.D., but rather during the post 2000 era. To prepare ourselves for a possible timber crisis during the period, 2000-2026 then, we should invest in forest renewal activities and consider limitation of wood exports. The latter may not be feasible though, since earnings from wood exports are also important in view of the country's balance of payments problems. This implies that more attention should be paid to renewal of forests (denuded and inadequately stocked), to augment future timber supply.

While the PREPF study points out the trade-offs which need to be considered when deciding on forest exploitation and renewal rates, it does not attempt to quantify the costs and benefits implied by various alternative futures for timber supply and local requirements. Thus, policy issues such as the log export ban, reforestation using various schemes, the allocation of forest land for various uses, and similar issues still remained untackled.

Nevertheless, workable analytical tools, which, when integrated with the PREPF studies can provide more definite answers to such policy issues, have already been developed. Most noteworthy of these are the works of Revilla (1978), Sibal (1978), and Nguyen (1974).

Revilla (1978) developed a model for the management of dipterocarp forest stands. A computer simulation model was used, allowing varying demand and interest rate levels; and cost considerations, among others. The application of such a study on a representative sample of the logging concessions in the country together with forestry investment wood, export, supply and demand considerations would allow for a more integrated approach to determining the national forest exploitation rates, wood exports, and forest renewal problems. In this regard, the studies of Nguyen (on wood production, investment, and export) and Sibal (on wood export supply and demand interactions) should prove very useful.

All together, then, an extension of the PREPF study which would make use of Revilla's model, define in explicit terms costs and benefits through the use of Nguyen and Sibal's studies, among others, would provide a workable analytical mechanism for investigating national forest policy issues such as forest exploitation and renewal rates.

B. FACTORS LEADING TO OVERCUTTING OF FORESTS

The rate of forest drain has been estimated at 172,000 hectares per year during 1962-mid seventies, and 204,000 hectares per annum for the period 1969-1976 (PREPF, 1977). Criticisms over the estimate of both rates include the following: (1) that the calculation of 172,000 hectares per year is based on the arithmetic mean which is misleading because the actual drain for the earlier years are actually much higher than those of the recent years (Arellano, 1979); and (2) the PREPF figure is partly based on an estimate of 1976 forest cover using LANDSAT photointerpretation, the methodology of which has been subject to varied criticisms.[4/]

The more important things to note though, would be the factors which have led to forest drain. These factors may be summarized as follows (Segura, et al 1977): (1) land classification biased towards non-forest use; (2) slow rate of land classification; (3) inappropriate policing of forest users to conform with forest rules and regulations, and, (4) granting of uneconomic sized concessions with short durations. The first two factors will be treated along land-use problems elsewhere, while the last two will be analyzed, together

---

[4/] This occurred on several occasions during which the PREPF forest cover estimates were discussed.

with other factors not pointed out in the earlier study, in the following subsections. Although the main focus here is the economic environment under which forests had been overcut, relevant technological aspects will also be discussed briefly.

The Selective Logging System (SLS)

The implementation of sustained yield for the uneven-aged forest of the Philippines is via the selective logging system (SLS) which provides for the cutting and removal of mature, overmature, and defective trees while ensuring the healthy growth of residual trees. The following phases characterize the system: tree marking, residual inventory, and timber stand improvement (TSI). The marking of trees for cutting insures that adequate residual stock is left, which would grow into harvestable stocks in the future. Residual inventory is conducted after the harvest operations in order to provide basis for predicting the next cyclic cut, as well as for checking whether damage has been done to the residual trees (i.e., destructive logging has taken place). Timber stand improvement is conducted to assure a healthy growth of the newly cut forests.

Revilla's (1978) evaluation of the selective logging system indicate that, if properly implemented, SLS could be one suitable timber management system for our dipterocarp forests. The problem

seems to lie partly in the lack of implementation of all three phases of SLS. Such deficiency in implementation may be caused by the system's following shortcomings as pointed out in Revilla's study:

(1) the system is implemented nationwide without allowance for variations among timber management units in factors such as climate, site accessibility, adequacy of stand density, and economic conditions; and,

(2) lack of flexibility because of the use of a fixed percentage for the marking goal of the residual stand, reliance on residual inventory as a means of controlling logging operations.

It is possible then that because the system is "difficult to implement,"[5/] most concessionnaires opt for overcutting of trees and payment of fines. Although a recent study points out that SLS is financially sound in terms of returns per peso investment for the two logging set-ups analyzed (Rebugio, 1979), such finding cannot be generalized for all logging set-ups in the nation. Moreover, whereas Rebugio's study calculated net return per peso investment

---

[5/] That the system is difficult to implement has been pointed out in several occasions, one of which was during a PREPF workshop attended by the researcher.

to fall within 1.70-2.56, a recalculation by Cabanayan (1980) allowing for a lower share of the allowable cut being actually harvested on account of government rules and depressed log markets came up with only 0.269-0.67% net return per peso investment.

Until more rigorous researches are conducted however, such findings should not be considered conclusive. For example, the following shortcomings of Rebugio's study have also been pointed out (Agbayani, 1980); (a) the analysis considered only one cyclic cut instead of a perpetual series of cuts as should be the case under sustained yield concepts; and (b) treatment costs which are spent during the third phase of timber stand improvement were overlooked. Since Cabanayan's study follows Rebugio's procedure except for the assumption regarding percentage log production out of the allowable annual cut, it also suffers from similar flaws.

Moreover, a re-examination of the selective logging system and AAC determination must be conducted simultaneously with a definition of economic sustained yield (Revilla, 1978), irasmuch as any harvesting scheme should be feasible within the given set of economic and biological conditions. Such an investigation must also consider variations of SLS as well as alternatives to the system.

Allowable Annual Cut Determination

The amount of cut which would allow for sustaining yield over time is determined by the allowable annual cut (AAC) formula, which calculates the maximum yearly cut allowed for a particular forest unit. Only mature, overmature, and defective trees are logged selectively from the forest. The AAC is calculated based on considerations for subsequent yield from the forest; specifically, it is calculated on two cutting cycles.

Though based on sustained yield concepts, the formula used for determining the AAC employs a growth and yield prediction model which tends to overestimate future yield from second-growth forests (Revilla, 1977). Such model was developed by using data obtained from forests which were of relatively better quality than most Philippine forests (Rule, 1980).[6/] Thus, the general use of such a model for all forest management units in the country, including those with inferior growing conditions leads to over-estimates (and over-confidence) of future harvests, most of which have been found to be unrealistic (Revilla, 1975). Newer and more complete growth and yield predictions have already been developed since then and should now be

---

[6/] This was gathered through informal talks with foresters and other forest practitioners.

used as basis for such formula (e.g., Canonizado, 1976; Bonita and Revilla, 1977). These latter models allow for the following crucial factors which affect future forest yield: quality of site or growing conditions; years elapsed after logging; and initial density of residual forests.

Moreover, the AAC formula itself is unrealistic in that it assumes that equal cuts should be obtained from forests for two cutting cycles, and, it does not allow for the explicit recognition of certain economic considerations (Revilla, 1977). Thus, the urgent need to revise this formula to allow for an infinite number of cutting cycles, and economic sustained yield concepts. This should be a subject for future research which would incorporate the biological constraints with the economic. Again, this could be operationalized for each forest management unit (the license) as well as for national forest management considerations.

Economic Aspects

Resource overexploitation may result from the following: (1) common property aspects of the resource; (2) use of high discount rates; and (3) imperfect pricing of inputs and outputs.

1. Common Property Considerations

Common property theory of resource overexploitation refers to the case where there is virtually free access (or open access) to the resource. Gordon (1954), in analyzing the overfishing problem of certain fish species, points out that such aspect leads to non-pricing of the natural resource itself, which is also an input to production. This results in high economic rents initially realized from fishing. Overcrowding eventually follows among fishermen, and even when the rent is dissipated among the many fishermen (resulting in losses) high unemployment rates would discourage/disable exit from the industry (Clark, 1973).

Such a phenomena could be said to be true also for some forest users, specifically, the loggers and shifting cultivators. Low taxes and charges paid by loggers for their harvesting business (Segura et al, 1977), may be equivalent to the condition of underpricing stumpage. When taken together with the buoyant log export market in the sixties, this may have led to the extremely high profits in logging/log export activities, and the consequent proliferation of fly-by-night loggers. In the case of shifting cultivation, virtually ineffective forest protection, increasing landlessness, and a general lack of orientation for the conservation/preservation of <u>anything public</u> may be counted as factors which lead to forest mis-use.

2. Use of High Discount Rates

Even when entry to a renewable resource-based industry is not easy, resource over-exploitation was still observed in fishing with high-powered ships (a capital-intensive industry). Such a phenomenon results from the use of high discount factors by resource users (Clark, 1973; Ciriacy-Wantrup, 1963; Pearce and Rose, 1975). When the latter are faced with capital constraints and yet need to use capital intensive technology they maximize return to capital.

This may also be true for the capital intensive loggers in the country. In fact, the use of high discount rates which may have resulted in forest overcutting by concessionnaires and licensees may have actually been compounded by the following factors: (a) uncertainty about receipts from future harvests of second-growth forest because of the relatively short tenure for licenses (vis-a-vis the long time needed for forest regeneration); and (b) granting of small-sized concessions thereby necessitating the need to recover <u>high</u> capital investments in logging equipment in a forest (Segura, et al, 1977). One may argue then that in addition to the lack of conservation ethic on the part of the loggers, the economic constraints that they faced may have actually led them to the "economically sound" decision of overcutting the forest as well.

In the case of the shifting cultivators, majority of whom are at subsistence levels of living, high preference rates for meeting present needs are most likely reinforced by the short-term (one-year) forest occupancy permits, during which they are supposed to conduct soil conservation measures or face ejection from the forests. To date, forest occupancy permits are granted for two years and can be renewed, provided ample proof of developing the occupied upland area is present.

High preference rates for present consumption may be true not only for the private users of forests; they may also be true for planners of low-income, capital-poor, less developed countries who have had to focus attention on the immediate needs of the populace. In fact, for most countries, only when symptoms of resource exploitation and environmental problems were felt had concern been expressed on natural resource management problems.

This does not necessarily imply however, that a general lowering of the interest rate needs to be imposed to encourage resource conservation projects and activities. Scott (1972) and Myers (1977) for instance, point out that a general lowering of i would induce more investments and higher economic growth rates, which in turn would put more pressure on resource exploitation. What may be done, though would be to lower i for resource conservation projects, such

as what is being done now to encourage investment in tree plantations in the Philippines.

Whether such lowering of interest rates is sufficient still needs to be investigated along with rates of return that could be expected from tree plantations, undertaken by businessmen and/or small upland farmers. Studies need to be conducted on the availment of such incentive and the nature of capital market available to tree growers.

3. Pricing of Inputs and Outputs

Among the benefits of forest production are ecological balance, recreation, provision of potential water supply, and wood products. The first three are generally long-run benefits whose use are mostly non-mutually exclusive. Thus, their valuation is difficult to quantify in monetary terms. Consequently, the value that has been generally attached to forests has been that of standing timber only, resulting in an underpricing of the total forest value. This has partly led to wasteful and often destructive forest use, whose costs to society have been difficult to estimate.

Moreover, even the value of standing timber (or stumpage) itself, has been underestimated. As stated earlier, Philippine forests are publicly owned and their use for logging purposes has been awarded to private individuals through the licensing system. Such individuals pay the following fees in relation to logging: forest charges, license fees, real property taxes, sales taxes and export taxes. Of these taxes, forest charges were imposed for internal revenue generation, license fees for the permit to operate a business, real property taxes for the use of government land (P.D. 888), and the rest as forms of the usual excise taxes on produced goods.

None of these resemble stumpage appraisal, which allows for the computation of value of the final products, costs associated with producing it, and allowance for profit and risks (Gerard, 1917). Although such a system of attributing value to stumpage as an input to production and as a basis for government to earn its due from being the public forest manager was advocated in the Philippines in the late fifties (Chinte, 1957), it has not been adopted partly due to the difficulties involved in its calculation. However, an attempt was made by Serna (1974) to look into the operationalization of the stumpage appraisal system in connection with the valuation of timber concessions. Serna's study, in fact, involved a detailed examination of the costs associated with operating a forest concession.

More recently, though, a larger number of decision-makers have indicated favoring the stumpage appraisal system as a more efficient way of valuing standing timber (NRMC, 1980). But, legal problems in implementing it were pointed out due to the fact that: (a) it has been considered to go hand-in-hand with bidding as a basis for awarding concessions; and, (b) the major portion of Philippine timber-producing forests have already been awarded as concessions/licenses. A suggestion was then made to apply it for future new concessions, and to adjust forest charges during the interim period (during which licenses are expiring).

The more important thing to note is that forest concessionaires must be made to pay a fair price to the public, at the same time that the public allows the former to earn returns as an entrepreneur, under the economic constraints within which logging/manufacturing is conducted. In fact, the user cost concept (Nautiyal, 1977) must be examined for possible incorporation into forest taxation determination, and as a possible tool for regulating cuts from forests. For instance, standing timber should not be priced so low that it encourages wasteful use of the resource. Certainly, the move to integrate forest charges, fees, and other collections into one fee, and with upward adjustments, is a step in the right direction, in terms of allowing the government to earn due revenue from the forest.

For future studies on the forest taxation system, due attention to the various forms of taxation and their corresponding effects should be made. For instance, in its current form and value which approximate that of a severance tax, forest charges should not be expected to drastically affect the decision to harvest, at least, in theoretical terms (Gregory, 1972). In the case of real property taxes which are collected regardless of whether harvests are made or not, the opposite case may be true. Returns from forest harvests are expected to be earned periodically (i.e., not necessarily annually); yet, real property taxes are supposed to be collected annually. The longer time periods involved in forestry production make this tax burdensome, when compared say, to a yield tax (Gregory, 1972). It is perhaps, no wonder then, that clamor for the amendment of current real property taxes for timber has been expressed (Arañez and Baggayan, 1978).

PART II

THE FOREST RENEWAL PROBLEM

Government effort to restore forest vegetation met the following problems during the last two decades (Viado, 1964):

(1) inadequate funds for labor wages;

(2) lack of vehicles, tractors, and other equipment needed for better management of reforestation projects;

(3) lack of technical personnel to undertake research work and other technical duties which have direct bearing on reforestation activities;

(4) absence of audio-visual apparatus and printing machines to enhance its reforestation work;

(5) kaingineros / other illegal occupants; and,

(6) reforestation of forest areas outside the jurisdiction of the reforestation administration.

While such problems have been tackled through administrative reform, increased budget for reforestation projects, research on technical aspects of forest renewal, and increased extension work in forestry, the more basic problem of lack of planning in reforestation work in general is remains a major undertaking. Such a problem is widely

recognized among experts on forestry issues (NRMC, 1980); in particular, indiscriminate tree planting has been said to characterize reforestation effort in the country. Among the recommendations made by the same group of experts were the direct involvement of the private sector in forest renewal efforts; in addition, a caveat was expressed that hardwood species should not entirely be replaced by the softwood, fast-growing species, on which current reforestation efforts seem to have focused on.

Forest Renewal through Private Enterprise

Similar economic factors which led to destructive forest activities (such as illegal logging, over-cutting, and slash-and-burn cultivation techniques) may be said to have partly caused the lack of interest among private forest users in seriously conducting forest renewal activities. These are: high time preference rates; shortlived tenure in forest use; and misvaluation of costs and benefits of timber production. Perhaps to partly grapple with such economic constraints, the following recommendations were made during the 1978 First Philippine Forestry Congress (Arañez and Baggayan, 1978):

(1) tax incentives, such as capital gain treatment of growing timber; 100 per cent exemption from income taxes of "all investment derived from any and all sources put into tree planting;" abolition of the real property tax on

timber growing land; and abolition of application fees, harvest fees, and the like;

(2) revision of the policy on tenure to allow for forest land use for more than fifty years;

(3) providing for an environment which would make the wood industry more viable, such as: more liberal log export allocations; facilitation in the processing of documents, and the like.

Such recommendations need to be studied in the light of the the following: the need to restore protective forest cover in critically denuded areas in the country; possible supply bottlenecks in world timber products (including wood-based energy); and the need for products of fast-growing wood species, both by local and foreign consumers. Research on such recommendations should take into account existing studies on the establishment of forest plantations, such as those summarized below.

Mindajao (1978) reports average financial rates of return of 59 per cent for tree farmers of the Paper Industries Corporation of the Philippines (PICOP) who were financed by the Development Bank of the Philippines (DBP). PICOP tree farmers who did not avail of DBP assistance earned an average return of 53 per cent while working on smaller-sized farms.

The tree farming scheme of PICOP involves 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 buyer) for the tree farms'produce. Mindajao's study on the PICOP tree farmers show that two main reasons for continued farmer participation in the venture are high returns on family investment and the presence of an assured market. Among those non-participating farmers also interviewed in the same study, the following reasons were cited for non-participation (arranged according to degree of importance): lack of suitable land; lack of family manpower ; lack of time to attend to tree farming; and, not wanting to wait for too long a time before trees could be harvested.

Indeed, the availability of land is an important factor to consider when reforestation work is to be done by forest dwellers. In the PICOP case the participating farmers were land owners themselves.

Some views informally expressed on the PICOP tree farming scheme also point out that PICOP did not have to invest in infrastructure anymore, in as much as it already had one in its present concession. Thus, the PICOP scheme entailed only the expansion of its operations to include tree farmers located in the periphery of its forest concession; the tree farmers' pulptimber augmented PICOP's

own pulptimber supply from the latter's plantations within the concession.

In a separate study, Gendrano looked into the feasibility for an already existing pulp and paper manufacturing firm of establishing its own tree farm. Gendrano (1974) calculated a potential rate of return of 27 per cent.

Such studies, however, provide only indications of what to expect of tree farms. More complete studies which would be relevant to the reforestation needs of denuded upland areas should include the following aspects: the establishment of tree farms and infrastructure needs for marketing; and, the processsing component. While denuded areas are found in Luzon and the Visayas, majority of the efficient processing plants for timber products are found in Mindanao and the immediate vicinity of Metropolitan Manila. With the much repeated complaint about costly transport and freight services in the country as seriously affecting our ability to process wood products which would be competitive in the international market (Economic Development Foundation, 1968; Sanvictores, 1975; PDCP, 1977), the problem of planning for forest renewal cum marketing and processing needs is indeed a must. Future investigation into the marketing aspect of forest renewal must look into the possibility of creating a log market where sellers and buyers would meet (Clawson, 1978). This may be more important for reforestation projects which would focus on the less bulky wood-producing

species.

Government reforestation work has accelerated only in the last decade. And, there are doubts about whether the government can afford to shoulder the expenses to reforest five million hectares of denuded land (Monsalud, 1977), especially because reforestation work in such areas entail heavy financing (Sanvictores, 1979).

The generation of funds for various reforestation strategies needs to be explored. Monsalud's (1977) proposal of having BFD reforestation work supplemented by a quasi-government agency would be one to consider. It was suggested that funds be generated through additional forest charges on the concessionnaires and licensees.

A concomittant study would be that on trying to determine the impacts of forestry development activities by the private sector. The most comprehensive study on the community impacts of a forestry concession was conducted by Gutierrez (1973) on the Paper Industries Corporation of the Philippines(PICOP). Here, the areas where PICOP could substantially increase its positive effects on tthe communities surrounding the concession were also identified. Mindajao's (1978) study, on the other hand, focused on the direct beneficiaries of the PICOP tree farming project from the farmers' viewpoint. His attempt to evaluate costs and benefits from the public's viewpoint yielded an economic rate of return of 23 per cent, after allowances for loans and shadow prices for labor were made.

Upland Development and the Shifting Cultivation Problem

The problem of shifting cultivation is expected to become more acute with increasing landlessness and high population growth rates. Whereas there is no agreement on the extent of the kaingin problem (Serna, 1972), recognition of the need to develop appropriate strategies for managing forest occupants has been exhibited. In fact, the following government efforts on developing forest occupants into more productive farmers are being tried: resettlement approach; the family approach; communal tree farming; and other variations.

Resettlement entails the transferring of the shifting cultivators to areas more suitable for agricultural production. Attempts at resettlement, however, have not shown much success. Reyes (1977), in a study of kaingineros' attitude toward resettlement, found that a high level of knowledge of the beneficiaries could not guarantee a favorable attitude towards being resettled. It has also been pointed out that for a resettlement to be viable, high capital outlays need to undertaken for the development of infrastructure and social services, as well as income-generating activities. Moreover, the problem of finding vacant public lands for resettlement areas need to be tackled (Beloso, 1970).

The family approach of forest occupancy management at Malaybalay, Bukidnon assigns lots to families for reforestation.

Intercropping with food crops is allowed until it is no longer feasible, i.e., trees have grown to sizes which do not enable agricultural crops to survive. The farmers are then paid according to trees grown, and are then transferred to another area to work on.

On the other hand, the Pantabangan scheme entails the growing of seedlings by families in their own backyards or in a communal nursery. They plant tree seedlings in three to five hectare lots and are paid via six installments in two years' time.

Both the "alaybalay and Pantabangan reforestation schemes follow the "taungya" system of the Burmmese forestry villages (Pollisco, 1978). They basically follow the concept of hiring kainginero families for reforestation work, while at the same time allowing them to grow agricultural crops for their immediate needs. The government takes over the maintenance and protection of established plantations after the end of the two-year contract with the farmers (Baggayan, 1977).

Whether such an approach of hiring people to do reforestation work is a permanent solution to the forest denudation problem remains to be investigated upon. It is possible that if compensation is too low, the shifting cultivators would prefer to grow agricultural crops (Binua, 1971). And, in some cases, the kaingineros themselves have been suspected to be the same ones who set fire to the areas

where reforestation work was done. This may be attributed to the lack of alternative means of livelihood; burning the area where they conducted reforestation work would mean that the shifting cultivators would be hired again to reforest the area.(Segura-de los Angeles, 1980). This is one caveat which should also be considered in reforestation work by the private sector in as much as forest renewal by the forest concessionnaires also runs along the same strategy of hiring forest occupants (Sanvictores, 1964).

The need to develop a total approach to kaingin management is now widely recognized, as a result of insights gained from various sociological studies on shifting cultivators (e.g., Duldulao (1977; Rebugio, 1969). In fact the term "agro-forestation" has been used also to describe the strategy being adopted in the Forest Occupancy Management Program of the government. While agro-forestation, as defined in several ways [7/] may also be a business undertaking for the non-kaingineros, Duldulao (1979) points out that priority should be given to the kaingineros and the landless farmers for the following reasons: (1) " they are in the best position to develop lands since they could use their own labor in the process; only a small amount of

[7/] A summary of the different meanings of agro-forestation may be found in Segura-de los Angeles (1979).

financial assistance may be required from government to make the program succeed if these are the groups who get the leases; and, (2) kaingineros have already occupied the land; even if they are to be driven out, they will most likely fight. Indeed, the potential for developing the uplands seem to lie in the abundance of labor in these areas, and the need for political stability. Whether the development of the uplands through the management of shifting cultivators is less costly still remains to be seen; the need for establishing infrastructure and social services in these areas may also entail more funds.

When compared with the private sector's strategy of restoring forest renewal, however, the latter may still be more expensive. The more important thing to note, however, is that the shifting cultivators' problem can no longer be ignored. That is, whatever upland development activities will be conducted in the future should be complementary; otherwise, none of these will have sustainable effects. A recent investigation into pilot agro-forestation projects, for instance, points out the land-use problems in an upland area in the Northern Philippines as a combination of the erring loggers' problem, encroachment by pasture leasees and kaingineros, and landgrabbers,are forces which threaten the initial gains of the pilot agroforestry project in the area (Segura-de los Angeles, 1980).

Most studies conducted on the upland farmers focus on their basic characteristics; that is, research on upland farming, having been conducted on a case study basis, have concentrated on the socio-economic profiling of the farmers. [7/] While these are useful for providing benchmark information on the farmers, there is a need to direct such research towards problem-solving. Questions on: maximum population density sustainable for various cropping systems, optimum cropping mix and cycles; credit support; labor utilization, and the like need to be answered in order that sustainable strategies for upland development are evolved.(Llapitan, 1979; Cagampang, 1972).

The problem of implementation also needs to be looked into. How will existing institutions be tapped for upland development? The only on-going study on the institutional framework of upland development is that being conducted by the Upland Hydroecology Program at the U.P. at Los Baños (Sajise, 1980).

Another important issue is that of dealing with the cultural minorities and the need for developing them within norms acceptable to their traditions. An important work by Palma-Gil (1976) provides an initial working framework for a total approach towards development. This study highlights the following strategies: (a) agricultural resource mobilization; (b) external and internal market development;

[7/] See for instance, the studies summarized by Librero (1977), del Castillo (1979), and Ganapin (1979).

and (c) the development of supportive infrastructure and institution building.

With respect to the land tenure problem (briefly mentioned in Part I above), the granting of a two-year forest occupancy permit to shifting cultivators may yet still be an insufficient incentive towards developing the land. While the granting of such a permit, as provided for in BFD circular No. 9, Series of 1980, is an improvement over the one-year permits earlier provided by law, the period may not be adequate time for the shifting cultivator to prove that he has undertaken upland development activities which are supposed to include the planting of trees. When examined against the twenty-five year lease allowed for 100-hectare industrial tree plantations abd/or agro-forest farms, and ten-hectare tree farm lease agreements (MNR Administrative Order No. 4, 1980), the two-year forest occupancy permit is really short-term.

The recent launching of the Communal Tree Farming Program represents a marked improvement for forest occupancy management. Here, an area of at least ten hectares is awarded as a twenty-five year-lease to a group (e.g., barangay) of farmers for development into agro-forest farms (BFD, 1980). A necessary condition to a CTF is the formation of strong farmers' organizations, which would entail more efforts at human resource development activities, for the distantly located shifting cultivators.

Watershed Development

Watershed development has been a main concern with the realization of water supply - demand bottlenecks. The management of forest for watershed protection has, however, been hampered by lack of technical information on the physical, biological, and climatic factors of watershed renewal. Thus, on-going research for watershed development have focused on the inventory of such factors (UPLB-UHP, 1978, 1977, 1979; Umali, 1977).

Feasibility studies on watershed management attempt to quantify the non-timber benefits of forest renewal. For example, the studies for Pantabangan and Magat watersheds (NIA & ECI, 1978; NIA & Madecor, 1979) include the following primary benefits: crop production; grazing; forestry; reduced reservoir sedimentation; reduced damages to roads and resettlements; and, improved employment opportunities. Other benefits were mentioned but, these were not attributed solely to the project because of the presence of other complementary projects, to wit: the building of the Dam, and the development of the Upper Pampanga River Project.

Watershed development for the protection of reservoirs necessitate the building of dams and consequent displacement

of communities. Thus, questions on the identification of project benefits and costs, and their deistribution, have been raised along with problems attendant to the planning and implementation of watershed development activities. Follow-up studies on the conditions of displaced and resettled communities point out the following (NIA & UPIEP, 1975): inadequacy of housing, water, and health facilities; and undervaluation of property lost due to inundation, for which payments were made by NIA to the residents of the old Pantabangan town. A more recent study by Floro (1980) highlighted the negative impacts of resettlement on the production/consumption activities of the families, several years after they have been displaced and resettled.

Indeed, the need to focus on human resource development for such projects have been pointed out (Ymzon, 1980). Moreover, the more basic issue of whether such similar community displacing projects is warranted has been raised (UGAT, 1979).

Another important aspect of watershed development is the complementarity of various development projects in upland areas (Segura-de los Angeles, 1980). A broader issue is the consistency of policies which affect projects in such areas. Saplaco (1979) thus, points out the need to catalogue and evaluate policies relevant to watershed development.

PART III

MULTIPLE USE FORESTRY

While current management of Philippine forests follow the multiple use concept, the latter's operationalization is still at its initial stage. Although multiple-use districts already exist in the country, difficulties in putting it in more concrete terms arise due to the lack of technical information on production possibilities of the numerous ways of using the forests (Revilla and Bonita, 1978).

And yet, operationalizing multiple-use forestry would be important in analyzing the trade-offs that may be involved in forest land use. An attempt was made by Serna (1980) to investigate the closing down of certain forest lands for watershed protection (PD 1559), wilderness areas (LOI 917), and food production areas (PD 472). The study's calculations of revenue lost due to the closing down of commercial forests to logging amounted to ₱719M per year of government revenue, and $430.28 B annually, of foreign exchange earnings. Serna added, however, that, such closing down of otherwise loggable areas are indications of the high priorities attached to non-timber forest uses, such as for wilderness, watershed, and food production.

A workable model for examining multiple use alternatives has already been developed, and may already be implemented for certain forest units. Such a model was formulated and operationalized by Balangue (1980) for looking into the development alternatives for Mt. Makiling. A goal programming model was used to allocate forest resources for recreation, water, timber, forage, non-timber products, and agricultural crops. Evaluation of alternative forest uses was in terms of environmental and economic impacts.

A goal programming model has the following advantages over other resource allocation models: (1) it allows the use of various criteria, which need not be expressed in the same units of measure (such as monetary terms, in most models); (2) such criteria may be prioritized according to the preferences of the decision-maker, the implementors, and/or the actual users; and, (3) what are being minimized in the objective function are deviations from goals, rather than the usual optimization of a single measure of efficiency. For these reasons, such a model has been suggested to be employed for examining multiple uses of forest lands.(Revilla, 1977).

The following sub-sections focus on the other uses of forest land and timber.

Wildlife, Recreation and Rangelands

Virtually no policy-oriented studies exist on wildlife management issues, forest use for recreation, and rangelands, though they are recognized to be important (Magno, 1979; Alvarez, 1979). Basic research on rangelands focus on the maximization of rangeland productivity, and the conservation effects of grazing, burning, and length of cutting interval. These need to be extended inasmuch as rangelands are important to food production. Control of rangeland activities, such as tenure area and durations need to be assessed in terms of their effects on conservation and the diffusion of benefits.

With respect to forest recreation, virtually no economic studies which have bearing on policy formulation exist. The prospect of the average Filipino's getting more inclined towards forest recreation activities still appear weak, which is characteristic of demand for leisure in less developed countries. On the other hand, tourism development as a tool for national development may put pressure on forest recreation; thus, it is important that the effects of tourism which is

forest-based needs to be evaluated.

Forest renewal efforts which are geared towards the development of these other non-timber products need to be evaluated in terms of their contribution to the communities where they are located. Thus, in this particular research need, micro-type of studies would be important for assessing specific policies and laws and their impact on socio-economic goals.

Minor Forest Products

Forest renewal for minor forest products has become important because of the prospects of countryside and energy source development thrusts. The use of fuelwood as energy source has been explored in various feasibility studies (e.g., Estudillo, et. al., 1970). In the case of the wooden furniture industries, researchers have focused on the following problems (PCARR, 1978):[8] unreliability of the supply of

[8] The PCARR study actually summarizes several researches on various problems of the furniture-making industry.

raw materials, marketing, and credit needs, and the development of managerial skills. Since the furniture-making industry has vast potential for countryside development and the generation of foreign exchange, more policy-oriented should be undertaken to take account of these problems, particularly the more basic one of supply bottlenecks.

In the case of dendro-energy, more basic information on the use of fuelwood for households needs to be gathered. Whereas the forest denudation problem is partly caused by the cutting of smaller-sized and younger trees for cooking, it may yet prove to be one which, if solved along forest renewal strategies, would result in huge amounts of savings in the energy import bill. This would be more important when firms (such as lumber kiln drying, bakeries, tobacco processing) would be able to develop more fully their technology for using dendro-energy. While basic researches are being conducted along this line[9/] policy-oriented studies also need to be done which would focus on the following: government support for dendro energy-using firms; involvement of the shifting cultivators in establishing energy farms, and the like.

[9/] Such studies are summarized in the proceedings of the Philippine Forest Research Society (1977).

PART IV.

ECONOMICS OF WOOD PROCESSING

Timber products are in varied forms, among which are those for construction, infrastructure support, furniture-making, paper products and others.

Focus on wood export processing, as an alternative to exporting raw logs initially arose out of the following considerations: (1) expectation of higher government revenue from taxes; (2) generation of income and employment; and (3) additional output (Sicat, 1968). More recently, one of the important additions to the pros of log processing is that of reduction of forest destruction (Cortes, 1976).[10] Whether there are already sufficient studies on such a policy will be gleaned from the discussion below.

Supply and Demand for Philippine Timber Products

Philippine timber products had been largely export oriented due to the weak effective demand of the domestic market and highly bouyant export market (Segura, et al, 1977). Demand for wood products being a derived demand, is therefore highly dependent on the final wood-using activities, such as construction, which in turn is more vibrant for the more developed countries.

---

[10] Cortes' article is also a good reference for the history of the log export ban and government measures taken to encourage domestic wood processing industries.

Most analyses of the market of processed wood products has therefore been in terms of determining supply and demand conditions in the international market (Ricasio, 1976; Segura, 1977; Nguyen, 1974; Sibal, 1974; and Valdepeñas, 1969). Segura estimated total foreign demand for Philippine wood products through the use of per capita income of the importing countries and export prices of pulpwood, lumber and veneer, for purposes of projecting such demand in the future. The demand functions which were estimated using time series data for twenty years, validated important economic concepts regarding timber demand: (1) that demand for necessary construction materials (lumber) is less income and price elastic than demand for 'luxury' construction material (plywood); (2) that demand for an intermediate input (veneer) is less income and price elastic than demand for its final product (plywood).

Ricasio's study estimated foreign demand for the same Philippine wood products in terms of national income, housing activities, and prices in particular wood importing countries. Sibal's analysis focused on export supply and demand for Philippine logs, lumber, plywood and veneer, through a simultaneous system of equations. Such a model could be used to examine some government controls which could aid in increasing Philippine competitiveness in the foreign wood market, such as, export taxes, price ceilings, and the like.

Nguyen's study focused on the physical production functions for logs, lumber, plywood-veneer, and pulp/paper products. In addition, export supply functions and models for employment and investment in the forestry sector were also developed.

In the case of local demand, only Segura's study attempted to develop a wood consumption index for approximating the need for timber products by various construction activities. This was used to provide rough estimates for future local demand. It points out, however, that effective local demand for wood as a construction material had been weak because of low incomes and lack of support for low cost housing (pre-1977). And yet, housing needs had become acute. Some form of government intervention may be appropriate here especially with respect to the pricing of wood products sold in the domestic market. Domestic wood prices had generally followed international wood products' prices, and are too high for the average Filipino. A study is in order here for the tools by which the wood industry could serve the needs of the local populace.

Competitiveness of Philippine Wood Exports

Philippine wood products exports have been experiencing decreasing competitiveness in the international wood market for the following

reasons:

(1) Although at the start of the processing industry some deficiencies in trade could already be observed, these were not immediately rectified because of the positive effects of the then preferential treatment for Philippine wood products in the U.S. market, effects of exchange rates and increasing demand (Brussier, 1964). Such deficiencies include: the need for efficient machineries; need to improve organization of work; uneconomic plant sizes; and wasteful processing techniques.

(2) For those small sized concessions which proliferated during the early sixties, logging was a more profitable activity (Valdepeñas, 1969); thus, the setting up of wood processing plants near concessions, as required by government much later, was accomplished only for purposes of following the law, rather than for serious consideration of wood processing. It is easy to believe then, that such plants were not built optimally, capacity-wise, among others.

Even when attempts had already been made to overcome such deficiencies and inefficiencies through the consolidation of various concessions and improvements in wood processing and wood waste utilization, the country still experienced more weakening of its competitiveness in the foreign market. Several studies focused on these and came up with the following analyses (Sanvictores, 1970; Sanvictores, 1975; Mendrano et.al., 1976; PDCP, 1977; Floro, 1978; Villanueva, 1978; Tecson, 1978; Umali and Gamboa, 1979):

(1) high production costs due to: high prices of imported inputs vis-a-vis high import content of wood products; increasing cost of electricity.

(2) low percentage recovery rates in processing low quality logs, since the high quality logs are exported in raw form. Our wood exports cannot then compete with the wood exports of Taiwan for instance, since the latter uses the higher quality logs imported from us.

(3) marketing problems leading to high freight and transport costs;

(4) disadvantageous effects of taxes.

The most comprehensive study conducted on wood industries and their exports was conducted by Floro (1978), who examined the development of the major wood processing industries in the light of the Philippine experience in import substitution and export substitution efforts. Floro investigated the factors which halted the take-off stage in log export processing, by analyzing backward and forward linkages via the input-output framework, capital/labor ratios and labor productivity in the light of comparative advantage in labor. Among the study's important results are:

(1) that most foreign competitors have a real comparative advantage in labor (in terms of labor productivity adjusted for wage rates);

(2) various controls imposed by the Philippines and its trading partners worsen the former's comparative disadvantage in wood processing.

Floro also reiterated the marketing problems which had plagued the wood industries.

Processed wood products have high import contents. And, certain policies have caused such dependence on imported inputs even more problematic. Umali and Gamboa (1979) point out that "tight monetary

policies for deferred payment imports" affect the industry's ability to replace obsolete machinery and expand capacities.[11/] Tariff protection of inputs has in fact, been ranked third among the disincentives cited by pulp and paper establishments covered by Tecson's survey (1979). Other disincentives pointed out were: import restriction in inputs, domestic taxes on inputs, and minimum wage-control, among others.

In terms of domestic resource cost, Villanueva's (1978) analysis of the pulp and paper industry indicate that the Philippines has comparative advantage only in the production of pulp. The domestic resource cost concept would be an important tool in further analyzing Philippine competitiveness in various wood products and should be explored when analyzing the effects of various policies on taxation, log export ban, employment in wood-using sectors, and the like.[12/]

[11/] An important study on the development of labor-intensive techniques for the forestry sector is that being jointly undertaken by the Bureau of Forest Development, International Labor Organization, and the Government of Finland (1977).

[12/] Studies conducted under the Industrial Promotions Policies Project (1979) shed light on the external (non-forest) policies which have significantly affected export processing industries.

Resource Productivity Studies

The use of labor-intensive technology and the need to increase waste utilization in the forest products industries have been key issues in the attempt to develop more competitiveness in the foreign market. In addition, the potential for countryside development through the forest products industries has been emphasized along with the forest renewal program.

A recent study on labor use in Philippine forestry was conducted by the Bureau of Forest Development in a joint research undertaking with the International Labor Organization and the Finland Government (1977). A major finding is that labor-intensive techniques which are also consistent with improved working conditions, safety, and ecology do exist in the Philippine forestry sector. Use of such techniques has, however, not been optimized because of the influence of forest technologies in capital rich areas, such as Japan and the United States (American Pacific Coast), which have been the country's major trading partners in timber products. The following proposals were therefore made to encourage the implementation of these techniques: (1) the formation of A Forestry Employment and Technology Working Group; (2) the adoption of guidelines on mechanization; (3) investi-

gation of incentives favorable to labor-use; (4) dissemination of information; and, (5) efforts towards training of workers.

Basic research on waste utilization are no longer scarce. Mendonez (1972) looked into wood waste of timber removed from the forest and came up with a rate of utilization of only 20 per cent, per 100 cubic meters of timber. The utilization rate for processing was found to be higher. The more recent studies focused on the optimal use of wood wastes, such as those conducted by Decena (1975), de la Cruz (1975), and Momo (1980).

Decena looked into the optimal allocation of logging waste among various alternative channels of processing; he concluded that logging waste contributes to the profitability of the whole system, and should therefore be processed. A similar conclusion was reached by de la Cruz, who investigated the feasibility of using logging wastes as raw materials for the production of lumber, veneer, and plywood. Momo's study focused on the feasibility of using wood waste from logged-over areas and using them to run a 6 - megawatt wood-fired steam power plant. This study points out that although such processing of logging waste is economically feasible, the most effective method of gathering wood wastes still needs to be studied, extraction and hauling costs having been found to

be major portions of investments for such processing.

The Log Export Ban

The log export ban was formulated to achieve the following objectives (Cortes, 1976):

(1) To rationalize the development of the wood industry through the (a) phasing out of uneconomic sized plants; (b) development of integrated wood industry and complexes; (c) establishment of wood industry centrals in strategic areas;

(2) Draw in capital investment from abroad for wood processing ventures;

(3) Accelerate our reforestation program in anticipation of the needs of our local processing plants;

(4) Encourage the establishment of industrial tree plantations; and,

(5) Curb the alarming destruction and denudation of our forests by destructive logging.

The gains expected from the eventual implementation of the ban were cited to be: employment generation; increased foreign exchange earned per unit volume of processed wood; lower costs of operating plants which would now be utilized at higher capacity; more competitiveness in the foreign market due

to the production of better quality timber products; income generation; and infrastructure development at industrial complex sites. The ban was to be implemented within the environment that would be created with the revision of the Forestry Code in 1975.

Initial opposition to the ban was expressed in a study by Armas (1976). Armas looked into the gains that would have been foregone, in foreign exchange measures, had the ban been implemented in 1976. He concluded that there would have been losses in foreign exchange earnings had the total ban been implemented; he also points out that the Philippines' being a forest resource-rich country is not a sufficient condition for its having comparative advantage in the forest products' market. A latter study by Quilloy (1978) adds that had the total ban been implemented and all logs processed domestically, the domestic market would have had to absorb the processed wood products because the foreign markets would not have been able to do so. Indeed, the suspension of the total ban was recommended because of a sluggish wood exports market (P.D. 865). Quilloy also adds that additional employment would have been generated due to increased use of processing facilities. It would seem then, that in the light of the findings of Floro and others on the lack of comparative advantage of processed Philippine wood exports mentioned

above, and marketing problems which are explored in the next section, the ban's implementation could not yet be fully realized.

Villiran's study (1978) which looked into the backward and forward linkages of the wood-based industries emphasize that such linkages wouldb be improved with the phasing out of log exports. The question of whether log production would decrease (and hence, domestic log production not markedly increase) remains to be researched on though. Whether log exporters would prefer to sell to the domestic market at much lower prices instead of maintaining the same amount of logs processed domestically which would then be sold at the usual prices, needs to be investigated upon. The following aspects would have to be considered for such a study: hoarding practices of wood products retailers; government price controls for logs and the processed products; income constraints on the part of wood products buyers; and, housing needs of the local populace.

Forms of government intervention in the local market for wood products need to be explored. In addition, specific policies, such as the seven per cent tax on domestically sold logs, which tend to push the final product's price upwards also need evaluation studies. If both the export market and

the local market remain sluggish, decreased operations in the wood processing industries might lead to massive lay-off of unskilled and semi-skilled workers and would aggravate the unemployment problem.

Marketing Aspects

The uneconomic location and size of processing plants as well as the effects of tariff and taxation policies on wood export processing are among the pressing issues which affect the marketing of forest products.

Several studies on the wood industry, such as those of EDF (1968) and PDCP (1977) came up with the following results on the problems of forest products transport:

(1) uneconomic location of processing plants;

(2) inadequate port facilities, infrastructure support, and shipping vessels;

(3) monopolistic freight charges in the international shipping scene.

The uneconomic location of processing plants may be said to be caused by government policy, as well as the orientation of the firms themselves. A survey by Moran (1978) of pulp and paper manufacturing products came up with the following factors

considered by such firms in their choice of plant location (arranged according to rank): availability of raw materials; low seller's price on raw materials; low freight cost of obtaining raw materials; availability of skilled labor; and, low freight cost of shipping final products. The location of plants of pulp and paper products may then be considered to be resource-oriented rather than market-oriented; this may be true for lumber, plywood, and veneer manufacturing plants, where even bulkier raw materials (sawlogs) are involved.

Moreover, government policy on the location of processing plants has also been resource-oriented. In the eagerness to promote local wood processing instead of exporting raw logs, government required all concessionnaires to be equipped with processing plants near or within the concessions. And yet, concessions are usually located in areas where infrastructure and utilities are not well developed, implying high electricity costs, among others. Thus foreign buyers of processed wood products have had to gather the latter from several loading points all over the country, resulting in high transport costs (PDCP, 1977).

There is a need, then to plan for the optimal allocation of processing plants, in coordination with the reforestation program, and availability of infrastructure and utilities.

Identification of log-excess and log surplus areas is not sufficient for determining plant location sites, for this neglects important marketing considerations, such as those mentioned above.

While such a plant location study needs to be conducted on a national and regional levels, firm-specific researches such as those mentioned below provide the tools of analysis which could be used for the larger study. Araño (1976) developed a log resource allocation model based on the transportation problem to evolve a program where total transportation costs of logs from 1,535 supply points in a Mindanao region is minimized. He found out that there is a need to establish an additional wood processing central; whether this was better than expanding the capacities of existing plants was not determined,in the study.

Another study (Rapera, 1978) used a mixed integer linear programming model to develop a plant-location-allocation model for Mindanao. The optimal number, location, and production capacities of different types of wood processing plants were analyzed in terms of (a)minimizing log transport cost from log excess areas to processing plants; (b)minimizing total set-up costs and product pmanufacturing costs; and, (c) considering economies of scale associated with different

plant sizes while meeting demand levels for specific wood products. Rapera, however, cautions against generalizations from the study's findings, on account of the study's use of data which were based on assumptions.

The operationalization of such a study using more realistic data and incorporating more recent developments (e.g., expansion of some ports, establishment of tree plantations) is urgently needed for analyzing the following: (1) implications on processing capacities and utilization with the full implementation of the log export ban; (2) demand levels which need to be satisfied to meet local requirements, as well as result on price stabilization; (3) huge investment outlays required for various plant types; (4) economies of scale in wood processing. Accompanying studies on the following related matters would also have to be made: (1) forms of incentives/disincentives to be used for optimal plant location; (2) creation of a marketing body for wood products; (3) assurance of fulfilling local needs for wood products.

Processing of Minor Forest Products

Processing of minor forest products indicate potential for development which could serve local needs, as well as help generate additional foreign exchange. Some problems related to

such development, however pose challenging issues for policy research such as:

(1) rampant dumping of surplus bookpaper by certain Asian countries (Mendrano, et al, 1976);

(2) seasonality of supply of raw materials, in the case of furniture production (MOSCOSO, et.al., 1979);

(3) difficulties met by foreign buyers in having to negotiate with numerous small producers who manufacture furniture products of various qualities (PCARR, 1978);

(4) scarcity of wood poles due to conflicts in licensing/use of a particular forest area (PCARR, 1978);

(5) the need to increase capitalization for the furniture-making industry (PCARR, 1978).

Researches are needed in order to provide basis for a more comprehensive planning in the minor forest products industries, which are generally labour-intensive, and therefore are significant for rural development.

PART V

RESEARCH AND POLICY ISSUES

Introduction

The following are the objectives of the Philippine Forestry Development Program (Cortes, 1979):

(1) to develop and maintain the country's resources at maximum productivity to assure that they will make maximum contribution to the national welfare;

(2) to complete the reforestation of all barren areas with top priority given to the 1.4 million hectares of degraded critical watersheds;

(3) to concentrate and stabilize forest occupancy in order to minimize, if not entirely eliminate, the destructive activities of illegal encroachers in the forests; and,

(4) to promote ecological balance by requiring forest users to adopt environmentally sound methods of exploiting forest resources.

In the same paper, Cortes outlines the following basic strategies adopted for achieving these objectives:

(1) the application of the multiple use and sustained yield forest management principles to develop the full potentials of the forests with due attention to environmental quality;

(2) closer supervision and control over forest users;

(3) intensified reforestation activity thru citizen participation and availment of foreign assistance;

(4) a comprehensive forest protection program for all forest lands.

Such objectives and strategies are cognizant of the potential renewability of forests, and the many products and services which it can provide. Achievement of the objectives are spelled out in more detail in BFD (1976 , 1980), among others, as a result of BFD's collaborative work with the Presidential Committee on Wood Industries Development (PWCID), a major forest policy-making body in the country. Policy formulation efforts of PCWID are spelled out in the latter's accomplishment reports (PCWID, 1979; 1980).

Basic Issues in Forestry Development Planning

1. The Need for an Inventory of Factors of Production in the Philippine Forestry Sector

A pre-requisite to the formulation of strategies for the development of a sector is knowledge of the available quantities and qualities of factors of production, which include: land and its attributes; labor; capital; and technology. Although inventory type of studies on these have already been conducted by DAP (1975), NRMC (Lachowski, et. al., 1978; Lorenzo , et. al., 1979); BFD/ILO/ Government of Finland (1977), and PCWID (1977), there is a need to continue conducting these studies, and, in more detail. This would necessitate the gathering of information initially at ground level, instead of through satellite photos, secondary data sources, or aerial photographs, in order to account for the following aspects: cropping systems of upland farmers; socio-economic profile of upland farmers; work conditions of laborers in forest-based industries; and, biophysical, climatic, and other factors which need to be considered in forest renewal activities and the development of upland communities (Raros, 1979). Existing research units which are gathering such information, such as the UPLB-UHP (Raros & Sajise, 1976), UNESCO-MAB and private institutions conducting

project pre-feasibility studies are focusing on a few pilot areas only. Hence, not all their findings are recommendations can be used to apply for all the other areas of the country.

Moreover, because of the multidimensional aspects of forestry, there is a need to conduct inventory type of studies in a holistic manner, instead of the current practice of researchers focusing on specific aspects in one particular area for each aspect. This way, the inter-action between the different factors of production in forestry are taken into account.

Availability of basic information on forest land would then allow assessment of the productive capacities, and the design of management schemes which are sustainable (Revilla, 1979; Umali, 1979). Various costs and benefits associated with such schemes could then be identified and evaluated against a specific set of criteria for optimizing the contribution of the forestry sector to development objectives.

2. Formulation of A Framework for A Comprehensive Forestry Development Program

The demands on the forestry sector will continue to increase in quantities, and in varieties, as the country pursues its various developmental goals. Specifically, the

need for food, energy, water, ecological balance, in addition to the traditionally recognized use of forests for timber production, will exert more pressure on forest production, conservation and utilization. The role that forests would assume in the nation's pursuit of growth and development objectives needs to be specified through a set of criteria, which would then have to be identified, while taking into account the peculiar characteristics of forestry production. Only when such criteria are concretized, in forestry terms, can forestry development strategies be formulated, and operationalized.

Such formulation of a comprehensive forestry development program would entail the participation of various disciplines and agencies, as well as the private sector. It would also require the evaluation of the various impacts certain forest activities made on nearby communities, in terms of the latter's quality of life. This implies a better understanding of the sector's role in rural development programs of the government. While several studies abroad provide insights into forest industries and rural development effects (e.g., Grayson, 1976), conclusions cannot be easily drawn from them because of dissimilarities in the conditions among the various countries studied.

3. Operationalization of Multiple Use and Economic Sustained Yield Forestry Concepts

Given the assessment of resources and capabilities of the forestry sector, and, a forestry development program which would optimize the sector's contribution to developmental goals, multiple use forestry and sustained yield forestry management can be operationalized in more concrete and realistic terms. Sustained yield forest management would then be defined in terms of biological, ecological, and economic terms. From the public sector's viewpoint, sustained yield forestry would take into account, self reliance in forest-based commodities and services, the distribution of these within a generation and across different generations. Such economic sustained yield forestry would most likely result in multiple use forestry, as well. From the private sector's side, economic sustained yield, in practice, would mean perpetuation of the life of the firm, given the economic constraints it faces.

All these would entail close monitoring of the following relationships: supply (physical and economic) and demand (local and foreign; needs versus effective demand) adjustments and corresponding market controls; valuation of amenities and services provided by forests; foreign exchange, and labor, among others.

4. Evaluation of Forest Renewal Strategies

Micro-level studies of present forest renewal strategies need to be conducted, in order to provide insights on their appropriateness to local conditions. The following aspects should be included in such studies:

(a) completeness of the strategy (plantation establishment; processing and marketing aspects; use of local labor and indigenous materials and technology;

(b) identification of beneficiaries and bearers of costs of a particular project;

(c) availability of support facilities and infrastructure.

The strategies which need to be evaluated in these terms are: family approach of reforestation; communal tree farming; PROFEM; industrial tree plantations; agro-forest farms; tree farm lease agreements; contract reforestation, and others.

At the macro level, there is a need to identify the various demands for wood products of reforestation projects, the establishment of strategically located processing centers; forest products marketing arrangements; and the like.

5. Studies on the Local Environment Within Which Forest Development Strategies are Being Implemented

There is a need to constantly assess the economic, political, and institutional environment within which forestry development is taking place. This implies relating the economic demands on the forest and wood industries to the controls (whether economic, technological, or legal) used for satisfying such demands.

Under this would fall studies on specific policies on taxation, tenure of concessions, permits, and leases, pricing policies, and legal controls, such as cancellation of licenses permits, and the like.

An integrated study on the local environment which affect forest development would allow policy-makers to view the manner by which economic, legal, and other factors inter-act to produce positive or negative effects on certain forestry developmental goals. Though such studies have already been attempted (e.g., Floro, 1978; Segura, et. al., 1977), they need to be continued due to new thrusts in forest policy formulation and implementation. The conduct of these studies before policy formulation or implementation would allow one to predict whether the controls envisioned for encouraging forestry development would be effective or

would just result in attempts to circumvent laws.

The literature review in Part I indicate that attempts will always be made to circumvent laws which are not framed realistically. Moreover, this results in the following negative effects: the practice of graft and corruption; too much effort on the part of government towards policing and punishing law breakers, instead of doing more productive activities; the need for trying to rectify the ill effects of wrongdoings by the private users of forests, some of which may be irreversible.

The following cases are cited for illustration purposes: (1) the prosecution of the shifting cultivators in the past; and (2) various attempts at punishing illegal and destructive loggers. Only when the Forest Occupancy Management program was formulated did authorities view the problem of shifting cultivation a s part of the broader problems of poverty, landlessness, and productivity. With respect to erring loggers, the most recent punishment being tried is the cancellation of licences. Casual observations, however, show that: after the cancellation of license, other forest destructive activities just follow (e.g., Revilla, 1980; Segura-de los Angeles, 1980); and, license cancellation results in uncertainty about the tenure of the other

loggers. Higher uncertainty implies higher time preference rates for present earnings, which , in turn, could result in more forest destructive activities. These are certainly urgent areas for research, which should also examine the administrative feasibility of formulating logging policies and regulation systems which are favorable to forestry development and forest renewal via the operationalization of economic sustained yield concepts.

6. Continuous Monitoring of the Global Environment Affecting the Philippine Forestry Sector

As shown in Parts I and IV, forest destructive activities are also affected by the international trade for wood products. And, forestry development is partly being geared towards trade. It is therefofe imperative that the role of the forestry sector in foreign trade be well defined, and issues on the need for developing self-sufficiency in forest-based commodities be tackled.

Concluding Remarks

The specific policy and research issues as discussed in detail in Parts I-IV, and broadly discussed in the previous sections are presented in Table 2, and are ranked according to priorities for research. A rank of 1 indicates the highest

priority.

This paper attempted to review and synthesize researches and policies which have implications on policy formulation in the Philippine development effort in general, and forestry development, in particular. Of the one hundred or so references on the Philippine forestry sector which are included in this paper, only around 20 per cent can really be considered to be policy-oriented.[13/] And, such studies are not easily accessible to the policy-makers since a majority of them are written in too technical terms. It is therefore recommended that: (1) more policy-oriented researches be conducted on forestry development issues; (2) efforts be taken for fuller utilization of studies on these issues; and, (3) future studies be conducted in a more coordinated and collaborative manner. The latter recommendation arises from the view that a number of

---

[13/] It must be noted here, that basic and applied researches which abound in Philippine forestry literature are not included in this review. For a summary of such researches, see PFRS (1977) and materials of PCARR FORI, FORPRIDECOM, BFD, PCWID, and the UPLB College of Forestry, among others.

forestry development problems are caused by a lack of a holistic view of the forestry sector. Forestry development planning, being one which has the potential of achieving multiple objectives, needs to be undertaken by various disciplines and institutions. While there is coordination among various vgovernment policy-makers on policy formulation in the form of inter-agency meetings, consultative fgroups, and the like, these usually happen in an ad hoc manner, i. e., when there is already a visibly urgent need to revise policies. It is doubtful that the separate policy recommendations made by various researchers, who have had the time to investigate problematic areas in a more detailed manner get to the policymakers in more comprehensible forms at all. And, more so, when a particular policymaker consults a researcher who is of the same discipline he is in.

o-O-o

Table 2

FOREST RESEARCH AND POLICY PRIORITIES

Topic	Rank
Inventory of Factors of Production in the Forestry Sector	
1. Forest Resources	2
2. Capital Investments	3
3. Labor	2
4. Shifting Cultivators	2
Formulation of a Framework for a Comprehensive Forestry Development Program	
1. Case studies on the local impacts of forest-based activities on developmental areas of concern	1
2. Local use of forest products and commodities	1
3. Availment of forest recreation facilities, parks and wildlife reserves by local and foreign visitors	3
4. Cost Benefit Analysis of Dendro-energy Development	
5. Food production in upland communities	1
6. Government revenue from the forestry sector; Income and Employment in Forest Lands; Foreign Exchange Generated.	4
7. Formulation of Criteria to be Used in Analyzing Forest Development Activities-in Concrete and Operational Terms	1

Topic	Rank
Operationalization of Multiple Use and Economic Sustained Yield Forestry Concepts	
1. Factors which affect forest harvest decisions in the private sector	2
2. Cost considerations in forest production activities	2
3. Evaluation of the Selective Logging System and the Allowable Annual Cut Formula	1
4. Supply and Demand of forest-based Products and Services; at National and Regional Levels	1
5. Valuation of Costs and Benefits of Various Forest Harvest Decision Criteria; of Various Multiple Use Schemes	2
6. Self-sufficiency in Specific Forest Products	1
Evaluation of Forest Renewal Strategies	
1. Case studies on the Family Approach to Forest Occupancy Management; Communal Tree Farming; Industrial Tree Plantation; etc.	1
2. Cost benefit analysis of alternative forest renewal strategies	1
3. Infrastructure and Social facilities in Upland Communities	2
4. Components of Watershed Development Strategies: Institutional Linkages; Human Resource Development; Marketing and Processing Facilities	2
5. Generation of Funds for Various Forest Renewal Strategies	3

Topic	Rank
Studies on the Local Environment within Which Forest Development Strategies are Being Implemented	
1. Analysis of the Taxation and Pricing Policies in the Forestry Sector in Relation to Economic Sustained Yield Concepts	1
2. Evaluation of the System by which Use of Forest Lands are Awarded for Specific Purposes; in terms of Conservation Orientation, Economic Sustained Yield Forestry from the Private User's Viewpoint; Equity considerations	1
3. Analysis of the Punitive Measures Taken Against Destructive Agents of Forests: Erring Loggers; Shifting Cultivators; Hunters; etc.	2
4. Inventory of Infrastructure, Port, Shipping, and other Marketing Facilities for Forest Products	3
5. Analysis of Local Marketing Arrangements of Forest Products	3
6. Government Policies Affecting the Use of Forest-Based Products, such as Housing, Price controls on Wood Products; Fuelwood Use, and the like	4
7. Analysis of Measures taken by the Firms for the Final Implementation of the Log Export Ban	2
8. Given the Forest Renewal Program, and Forest Harvesting Decisions Based on Economic Sustained Yield Concepts, Determine the Optimum Location of Processing Plants, Investment in Human Resources, Infrastructure, and the like	3

Topic	Rank
Continuous Monitoring of the Global Environment Affecting the Philippine Forestry Sector	
1. Assessment of Competitiveness of Philippine F Forest Products in the Foreign Market	5
2. Evaluation of Marketing Arrangements Entered into with other Forest Products Sources;	3
3. Analysis of Foreign Trade Controls (Tariffs, Quotas, etc.) in Terms of Their Impact on Specific Forest Development Activities	2
Others	
1. Re-examination of the Log Export Ban and Conditions it was Based On	3
2. Optimum Investment in Human Resources in Forestry ; Assessment of Forestry Educational System and Forestry Extension	3
3. Analysis of the Availability and Availment of Financial Capital in the Forestry Sector	3
4. Evaluation of Consistency Between General Policies and Implementing Rules and Regulations	4
5. Analysis of Existing Mechanisms in the Conduct and Utilization of Research in Forestry	5

REFERENCES

A. Local Sources

Agbayani, F.V., 1980. Selective Logging: An Analysis from the Public's Point of View. Paper submitted in partial fulfillment of the requirements of FRM 227 (Economic Analysis of Forest Policy), University of the Philippines at Los Baños, College, Laguna. Second semester, 1979-80.

Alvarez, J.B., Jr. 1979. Problems, Issues, and Strategies on Wildlife Management in the Philippines. Paper presented at the Fifth Natural Resources Management Forum, Natural Resources Management Center. Asian Institute of Tourism. 26 February 1979.

Araño, R.R. 1976. Optimal Log Allocation Among Wood Processing Industries. M.S. in Forestry Thesis, University of the Philippines at Los Baños, College, Laguna.

Arañez, G.B. and R.B. Baggayan. 1978. Reforestation and Afforestation in the Philippines. Paper presented during the First Philippine Forestry Congress, at the Philippine Village Hotel, NManila. 2-6 October, 1978.

Armas, A. 1975. A Social Cost-Benefit Analysis on the Total Ban of Log Exports in CY 1976. Discussion Paper No. 75-3, Development Academy of the Philippines Special Studies Program. December 15, 1975 (Mimeo).

Baggayan, R.B. 1977. A Place of Afforestation/Reforestation in Hill-Country Development. Asian Forest Industries. September-December, 1977. 25-26.

Balangue, T.O. 1980. A Goal Programming Model for an Integrated Use - Forest Management Problem. M.S. in Forestry Thesis, University of the Philippines at Los Baños, College, Laguna.

Beloso, R. 1970. Resettling the Kainginero. Philippine Lumberman. July 1970.

Binua, T. 1971. A rejoinder to FORPRIDECOM Commissioner's Suggestion to the Kaingin Problem. Philippine Lumberman. December, 1971.

Bonita, M.L. 1978. Philippine Lands and Forests, 2000 A.D. Third Lecture for the Guillermo Ponce Professorial Chair in Logging Engineering. University of the Philippines at Los Baños, College, Laguna.

Bonita, M.L. and A.V. Revilla, Jr. 1977. Philippine Forest Resources: 1976 - 2026. In PREPF (1977).

Bureau of Forest Development (BFD), 1976. Plans and Programs for 1976-2000. Quezon City.

_____. 1980. Primer on the Communal Tree Farming Program. Quezon City.

Cabanayan, O.C. 1980. Selective Logging: An Analysis from the Public's Point of View. Paper submitted in partial fulfillment of FRM 227 (Economic Analysis of Forest Policy), University of the Philippines at Los Baños, Second semester, 1979-80.

Cagampang, F. 1972. The Use of Credit in a Guided Cooperative Program with Sedentary Manobo Farmers in Sta. Cruz, Quezon, Bukidnon: A Case Study. University of the Philippines at Los Baños. October 1972.

Canonizado, J.A. 1976. Yield Prediction Function for Cut-Over Dipterocarp Stands. M.S. in Forestry Thesis. University of the Philippines at Los Baños, College, Laguna.

Chinte, F.O. 1957. Stumpage Appraisal as Basis for Awarding Timber Licenses. Bureau of Forest Development. (mimeo.).

Cortes, E.V. 1976. The Log Export Ban. Asian Forest Industries. Yearbook 1976.

Cortes, E.V. 1979. A Review of the National Forestry Development Program. Paper read at the Forestry Alumni Homecoming, University of the Philippines at Los Baños. 18 April 1979.

Decena, A. 1976. A Power-Generating Set-up for an Oil Conserving Integrated Wood Processing Industry in the South. Philippine Lumberman, October 1976.

De la Cruz, R.Z. 1975. Technical and Economic Feasibility of Utilizing Logging Wastes. M.S. in Forestry Thesis, University of the Philippines at Los Baños, College, Laguna.

Del Castillo, R.A. 1978. Population Data in Slash and Burn Forestry Communities in the Philippines. Paper presented at the pre-project implementation consultation on the U.N. FPA/FAO Project. Institute of Population Studies, Chulalongkorn University, Thailand. 13-15 December, 1978.

Development Academy of the Philippines (DAP), 1975. Inventory of Natural Resources. Papers of the Inventory of Natural Resources Project. Volume V.

Duldulao, A.C. 1975. Kainginero's Perceptions and Attitudes Towards Forest Conservation in Mt. Makiling, Laguna. University of the Philippines at Los Baños, College, Laguna (Mimeographed).

Duldulao, A.C. 1979). Sociological Aspects of Agro-Forestry. In PCARR (1979a).

Estudillo, C.P., E.P. Villanueva and P.V. Bawagan. Some Aspects of a Feasibility Study in Fuelwood and Charcoal Production from Ipil-Ipil. Philippine Lumberman. April 1980.

Floro, M.S. 1980. Economic Effects of Resettlement on the Organization of Production, Consumption, and Distribution in Barrio Villarica, Pantabangan, Nueva Ecija. Paper presented at the Seminar-Workshop on the Socio-Economic and Institutional Considerations of Upland Development. Sponsored by the Program for Environmental Science and Management, University of the Philippines at Los Baños, College, Laguna. 4-6 August 1980.

Ganapin, D.J., Jr. 1979. Factors of Underdevelopment in Kaingin Communities. Paper submitted in partial fulfillment of the requirements of Ag. Ed. 285. University of the Philippines at Los Baños, College, Laguna. Second Semester, 1978-79.

Gendrano, O.A. 1974. Tree Farming: A Feasibility Study for Bataan. Master in Business Management Thesis, Asian Institute of Mangement. Makati.

Gutierrez, R.C. 1973. The Impact of PICOP in the Socio-Economic Development of Bislig. Master in Business Management Thesis, Asian Institute of Management. Makati.

Lachowski, H.M., D.L. Dietrich, R.M. Umali, E.A. Aquino, and V.A. Basa. 1978. Landsat-Assisted Forest Inventory of the Philippine Islands. NRMC Research Monograph No.4, 1978.

Librero, A.R. 1977. Socio-Economic Considerations in Hilly Land Development. Paper presented at the International Workshop on Hilly Land Development, at Legazpi City, 3-6 August 1977.

Llapitan, E.A. 1979. Agro-forestation: The BFD Experience. In PCARR (1979a).

Lorenzo, E.N., B.R. de Jesus, Jr., and R.S, Jara. 1979. Assessment of Mangrove Forest Deterioration in Zamboanga Peninsula, Philippines, Using Landsat MSS Data. NRMC Research Monograph No. 2, 1979.

Madriaga, J.A. 1980. Productivity and Resource Use in Moluccan Sau Pulptimber Plantations In PICOP, Bislig del Sur. M.S. in Forestry Thesis, U.P. at Los Baños, College, Laguna.

Magno, R.A. 1979. Conservation and Management of Parks and in the Philippines. Paper presented at the NRMC Forum on Natural Resources, Asian Institute of Tourism, 30 August 1979.

Mendonez, B.C. 1972. A Study of the Rate of Utilization and Wastage of Three Selected Natural Resources - Land, Forest and Fishing. M.A. Thesis, Ateneo de Manila University.

Mendrano, E.M., B.R. Blanco, and E.C. Amio. 1976. Technological and Economic Problems of the Pulp and Paper Industry. FORPRIDECOM (Mimeographed). College , Laguna.

Mindajao, N.M. 1979. The Economics of Agro-Forestry. In PCARR (1979a).

Momo, J.B. 1980. Economic Study of Utilizing Wood Wastes as Fuel in an Integrated Forest Products Firm. M.S. in Forestry Thesis, U.P. at Los Baños, College, Laguna.

Monsalud, M.R. 1977. A Radical Solution to the Reforestation Problem. Asian Forest Industries. Sept.-Dec. 1977.

Moran, P.B. 1978. The Impact of Regional Policies on the Location Choices of Some Manufacturing Firms. Industrial Promotions Policies Project, Working Paper No. 11. July 1978.

Moscoso, V.P., N.M. Moscoso, and T.G. Cuaresma. 1979. Raw Material Requirements and Consumption of the Wooded Furniture and Joinery Industries. Asian Forest Industries Jan.-April 1979.

National Irrigation Administration (NIA) and Engineering Consultants, Inc. (ECI). 1978. Pantabangan Watershed Management Report. Draft Feasibility Report, Erosion Control Study. Vol. I-IV. November 1978.

National Irrigation Administration (NIA) and Mandala Agricultural Development Corporation (Madecor), 1979. Pantabangan and Magat Watershed Management and Erosion Control Projects, Feasibility Report.

National Irrigation Administration (NIA) and University of the Philippines Institute of Environmental Planning (UPIEP), 1975. Pantabangan Resettlement.

Natural Resources Mangement Center (NRMC), 1980. An Assessment of Philippine Forestry Management Problems and Issues: A Delphi PApproach. NRMC Policy Studies Series No. 1, 1980.

Nguyen D. 1974. An Econometric Model of Philippine Wood Production and Export. M.S. in Forestry Thesis, U.P. at Los Baños, College, Laguna.

Palma-Gil B. 1976. An Ikalahan Development Plan through the Kalahan Educational Foundation, Inc. Master in Business Management Thesis, Asian Institute of Management, Makati.

Pollisco, F.S. 1978. Agrisilviculture Concepts and Practices. Special Paper for the Eighth World Forestry Congress on the Theme: Forests for People. Jakarta, Indonesia. 16-28 October 1978.

Philippine Council for Agriculture and Resources Research (PCARR). 1978. Forest Products and Industries in the Philippines. PCARR project no. 174. Volume I: Timber and Wood Products, by F.L. Tesoro, E.D. Bello, and F. Pollisco.

_____ 1979. Timber and Timber Products Commodity, State of the Art for the Wood Furniture Industry of the Philippines. Mimeographed.

_____ 1979a. Proceedings of the Agro-Forestry Symposium/Workshop. PCARR, Los Baños, Laguna. 19-21 December 1979.

Philippine Forest Research Society (PFRS), 1977. Symposium Proceedings, College, Laguna. 15-16 December, 1977.

Private Development Corporation of the Philippines (PDCP), 1977. The Wood Industry. Manila.

Pollisco, F.S. 1976. Reforestation and Silvicultural Techniques for the Regeneration of RP Forests. Asian Forest Industries, Yearbook 1976.

Population, Resources, Environment and the Philippine Future(PREPF): Scenarios for the Year 2000. 1977. A research consortium of the Development Academy of the Philippines, the U.P. School of Economics, and the U.P. Population Institute. Volume II-3A. Philippine Forest Resources.

Presidential Committee on Wood Industries Development (PCWID), 1977. 1976 Statistical Kit on Forestry and Forest-Based Industries. March 1977.

_____, 1979. PCWID Annual Report, 1979. Quezon City.

_____, 1980. PCWID Performance Report, 1974-1979. Quezon City.

Quilloy, A.B. 1978. An Economic Analysis of the Policy on Log Exports. A research problem submitted to the Program in Development Economics. University of the Philippines, Quezon City.

Rapera, C.L. 1978. A Programming Solution to the Plant Location-Allocation Problem in Forestry. M.S. in Forestry Thesis, University of the Philippines at Los Baños, College, Laguna.

Rapera, R.B. 1976. Cut Scheduling in Industrial Forest Plantations by Linear Programming. M.S. in Forestry Thesis, U.P. at Los Baños, College, Laguna.

Rebugio, A.L. 1979. Financial Feasibility of Selective Logging: A Case Study. Paper presented at the Fifth Anniversary Symposium of the Forest Research Insitute. College, Laguna, 18 December 1979.

Revilla, Adolfo V. Jr. 1975. The Economic [illegible] Sustained Yield Forest Management Theory. College of Forestry, U.P. at Los Baños. Mimeographed.

_____, 1977. Operationalizing Multiple Use Forest Management in the Philippines. Paper presented at the U.P. Forestry Alumni Homecoming Symposium, College, Laguna. 13-14 April 1977.

_____, 1979. Land Assessment and Management for Sustainable Uses in the Philippines. Paper presented at eh the Conference on Forest Land Assessment and Management for Sustainable Uses, East-West Center, Honolulu, 19-20 June 1979.

_____, 1980. Framework for a Comprehensive Forestry Development Program for the Philippines. SEARCA Professorial Chair Lecture in Forest Resources Management, 21 August 1980, College, Laguna.

Revilla, A.V. and M.L. Bonita, 1978. Directrions for Development of the Philippine Forest Resources. Paper presented at the First Philippine Forestry Congress, Manila. 2-6 October 1978.

Reyes, I.E. 1977. The Role of Communication on the Knowledge and Attitude of Mt. Makiling Kaingineros Towards Resettlement. M.S. Thesis. U.P. at Los Baños, College, Laguna.

Reyes, L.D. 1978. Co-managership on Forest Resource Use. Paper presented at the First Philippine Forestry Congress, Manila. 2-6 October 1978.

Ricasio, S. 1976. Long Term Export Prospects with Respect to Domestic Supply and World Demand for Philippine Processed Wood Products. Paper submitted for Certificate in Program in Development Economics. University of the Philippines, Diliman, Quazon City.

Rule, L.C. 1980. Selective Logging: An Analysis from the Public's Point of View. Paper submitted in partial fulfillment of the requirements of FRM 227, U.P. at Los Baños, College, Laguna. Second Semester, 1979-80.

Sanvictores, J.G. 1979. Afforestation Work and the International Agro-forestry Development Project in Surigao del Sur. In PCARR (1979a).

Sanvictores, J.G. 1964. Aras-Asan Timber Company's Approach to the Kaingin Problem. Forestry Leaves, XV (3), 1964.

Saplaco, S.R. 1979. Watershed Management in the Philippines. Paper Presented at the Natural Resources Mangement Center Forum. Asian Institute of Tourism. 26 April 1979.

Segura, M. 1977. Demand for Philippine Timber Products in the Year 2000. In PREPF (1977).

Segura-de los Ángeles, M. 1979. Agro-Forestry Development Projects: Economic and Social Impact Analysis. ESIA/WID (Micro) Discussion Paper No. 79-34. Philippine Center for Economic Development, October 1979.

_____, 1980. Agro-forestry Development Projects: Description of Project Areas and Actvities. ESIA/WID (Micro) Discussion Paper No. 80-16. Phil. Center for Economic Development. October 1980.

Serna, C.B. 1972. Kaingin: Facts, Figures and Why. Philippine Lumberman. April 1972.

_____, 1974. A Technique for Determining the Value of a Timber oncession. Master in Business Management Thesis, Asian Institute of Management, Makati.

_____, 1980. Current Policies in Forest Land Use: Their Implications to National Development. Paper presented at the Symposium on Research and Policy Issues on Land Resources Allocation for the Philippines, at the Forest Research Institute, College, Laguna.

Sibal, P.V. 1978. An Econometric Analysis of Supply and Demand for Forest Products in the Philippines. M.S. In Forestry Thesis, U.P. at Los Baños, College, Laguna.

Sicat, G.P. 1968. Domestic Economic Gains Foregone by Exports of Logs and Lumber. Discussion Paper no. 68-5, Institute of Economic Development and Research, University of the Philippines, Quezon City.

Tagudar, E. 1978. Agro-Forestry as Practiced in PICOP. Asian Forest Industries. May-August 1973.

Tecson, G. 1979. Some Effects of Industrial Promotion Policies on Selected Manufacturing Establishments. Industrial Promotions Policies Project, Working Paper No. 24. U.P. School of Economics, Diliman Quezon City.

Tomboc, C.C. 1976. Growth, Yield and Economic Rotation of Bagras Pulptimber in the PICOP plantations. M.S. in Forestry Thesis, U.P. at Los Baños, College, Laguna.

Ugnayang Pang-Agham Tao (UGAT), 1979. Papers of the Second National Conference of UGAT, U.P. Baguio, 22-24 April 1979. In AGHAM-TAO, II (December 1979).

Umali, R.M. 1979. Forest Land Assessment and Management for Sustainable Uses in the Philippines. Papaer presented during the Conference on Forest Land Assessment and Management for Sustainable Uses, East-West Center, Honolulu, Hawaii. 19-28 June 1979.

Umali, R.M. and M.A. Gamboa, Jr. 1979. The Exportation of Philippine Mahogany Hardwood. Natural Resources Management Center Research Monograph, No. 1, 1979.

Umali, C.G. and F.R. Pameron, 1977. Major Researches in Range Managmment in the Philippines. Sylvatrop II (1): 23-30.

University of the Philippines at Los baños/Upland Hydroecology Program (UPLB/UHP), Annual Reports, 1977, 1979; Policy Report, 1978. UPLB- DNR-NIA-Ford Foundation.

Valdepeñas, V.B. 1969. International Trade and Investment Allocation in Philippine Wood-Based Industries. M.A. (Economics) Thesis, University of the Philippines, Diliman, Quezon City.

Vergara, N. 1960. Financial Rotation for the Production of Ipil-Ipil Firewood. M.S. Thesis, State University of New York, College of Forestry at Syracuse University. U.S.A.

Veracion, A.G. 1979. Agro-Forestry: the PICOP Experience. In PCARR (1979a).

Viado, J. 1964. Vital Problems Confronting Reforestation in the Philippines. Philippine Lumberman, X (3): 14-18, 1964.

Villiran, E.A. 1978. An Input-Output Study of the Philippine Wood-Based Industries. M.A. (Economics) Thesis, University of the Philippines, Diliman, Quezon City.

Villanueva, M.F. 1978. A Domestic Resource Cost Analysis of the Pulp and Paper Industry. Industrial Promotions Policies Project. Working Paper No. 19. U.P. School of Ecohomics, Diliman, Quezon City.

Ymzon, G. de la Costa. 1980. Rumblings from an Upland (the Pantabangan Experience). Paper presented at the Seminar - Workshop on the Socio-Economic and Institutional Aspects of Upland Development, sponsored by the Program for Environmental Science and Management, U.P. at Los Baños, College, Laguna, 4-6 August, 1980.

B. Foreign Sources

Beddington, Watts, and Wright, 1975. Optimal Cropping of Self-Reproducible Natural Resources. Econometrica, XLIII (4) 789-802.

Bentley, W.R. and D.E. Teeguarden, 1965. Financial Maturity: A Theoretical Review. Forest Science. XI: 76-87.

Brussier, J. 1964. Financial Analysis of the Plywood Industry. World Bank Resident Mission. Manila, June 1964.

Bureau of Forest Development (BFD)/ International Labour Organization/ Government of Finland. 1977. Appropriate Technology in Philippine Forestry. Report of the Joint BFD/ILO/Gov't of Finland Project. Geneva, 1977.

Burt, O.R. and R.G. Cummings. 1970. Production, and Investment in Natural Resource Industries. American Economic Review. LX (4): 576-90.

Ciriacy-Wantrup, S.V. 1963. Resources Conservation: Economics and Policies. Berkely: University of California Division of Agricultural Sciences.

Clark, C.W. 1973. The Economics of Over-Exploitation. Science, CLXXXI: 630-34.

Clawson, M. 1978. Public Log Markets as a Tool in Forest Management. Land Economics. LIV (1 Feb 1978).

Ferguson, I.S. and J.J. Reilly. The Social Discount Rate and Opportunity Cost of Capital in Forestry Development Projects. In Grayson (1976).

Floro. M.S. 1978. Export Processing in the Philippine Wood Industries. M.S. Economics Thesis. Monash University, Australia.

Gaffney. M.M. 1957. Concepts of Financial Maturity of Timber and other Assets. Raleigh: North Carlolina State College, Department of Agricultural Economics. September 1957.

Grayson, A.J. 1976. (ed.). Evaluation of the Contribution of Forestry to Economic Development. Forestry Commission Bulletin No. 56. London.

Gregory, G. 1972. Forest Resource Economics. New York.

Gerard, J. 1917. Forest Service Stumpage Appraisals. American Journal of Forestry. XV (6): 708-25.

Gordon, H.S. 1954. Economic Theory of a Common Property Resource: the Fishery. Journal of Political Economy. LXII: 124-142.

Holt, L. 1967. In Defense of the Traditional Forest Regulation Model. Journal of Forestry. LXV (2): 123-24 (Feb 1967).

Klemperer, W.D. 1976. Economic Analysis Applied to Forestry: Does it Short-Change Future Generations? Journal of Forestry. (Sept 1976).

Mindajao, N.M. 1978. Smallholder Forestry and Rural Development: A Case Study of the PICOP Project in Bislig, Surigao del Sur, Philippines. Ph. D. Thesis, University of Minnesota, U.S.A.

Myers, N. 1977. Discounting and Depletion: the Case of Tropical Forests. Futures, IX (6): 502-09 (Dec 1977).

Naslund, B. 1969. Optimal Rotation and Thinning. Forest Science, XV: 446-51.

Nautiyal, J.C. 1978. Use Cost in Renewable Natural Resources. Canadian Journal of Agricultural Economics. XVIII (2): 95-103.

Pearce, D.W. and J. Rose, 1975. The Economics of Natural Resource Depletion. New York: John Wiley and Sons. 1975.

Plourde, C.G. 1970. A Simple Model of Replenishable Natural Resource Exploitation. American Economic Review. LX: 518-22 (June 1970).

Rebugio, L. 1969. Shifting Cultivation, Population Density, and Settlement Patterns. Paper read at the Yale School of Forestry as partial requirement for the degree of Master of Forestry. February 1969.

Sartorius P. and H. Henle, 1968. Forestry and Economic Development. New York: Praeger, Inc.

Samuelson, P.A. 1979. Economics of Forestry in an Evolving Society. Economic Inquiry. XIV (4): 466-92 (Dec 1979).

Revilla, A.V. Jr. 1978. Simulation Analysis of Alternative Forest Management Strategies fpr Philippine Dipterocarp Forests. Ph. D. Thesis, Yale University School of Forestry.

Schreuder, G.F. 1971. The Simultaneous Dtermination of Optimal Thinning Schedule and Rotation for an Even-Aged Forest. Forest Science, XVII: 333-39.

Scott, A.D. 1972. Natural Resources:the Economics of Conservation. Toronto: Mclelland-Stewart, Second Edition.

Smith, V.L. 1968. Economics of Production from Natural Resources. American Economic Review. LXVIII (1968): 409-31.

Thompson, E.F. 1966. Traditional Forest Regulation Model: An Economic Critique. Journal of Forestry. LXIV (11): 750-52 (Nov 1966).

United Nations. Food and Agricultural Organization. 1971. Philippines: Demonstration and Training in Forestry, Forest Range and Watershed Management. Manila. March 1971.

Walker, J. 1975. What the Forest and Rangeland Renewable Resources Planning Act Means to the Timber Industry. In Rich, S.U. (ed.). Ecology, Environmentalism and Future Timber Supply. Proceedings of a Current Issues Conference, 18 March 1975.